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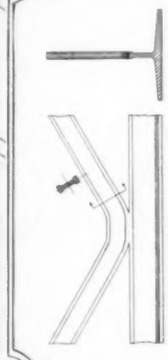
Electrical World

Mc-Graw-Hill Company, Inc. New York, April 22, 1922 Twenty-five Cents a Copy

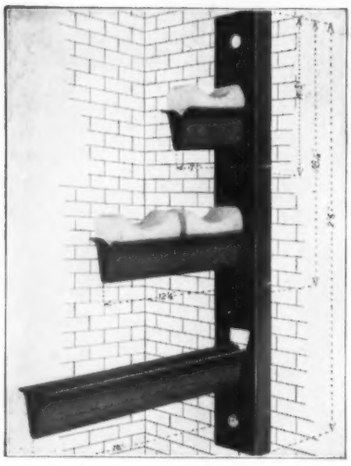
Bates Poles are made from structural steel at the rate of one pole every two minutes. The cost of Bates Steel Poles is less per mile of line, and prices can usually be quoted cheaper per pole than any other type of pole manufactured by man, or by nature

BEST
Bates Expanded Steel Truss Co.
208 South LaSalle Street, Chicago, U. S. A.

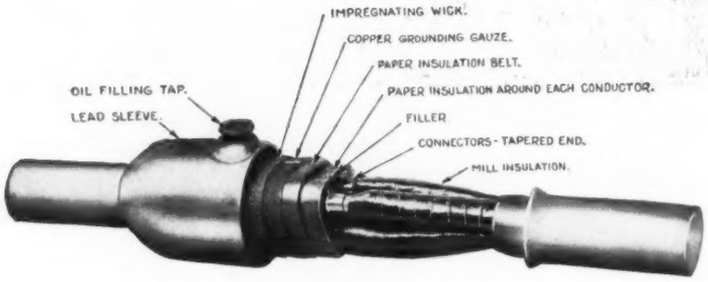


Bates Joint
Original, unsheared connection. No rivets, no welding, no interior or overlapped surfaces.

BATES ONE PIECE EXPANDED STEEL POLES



Metropolitan Cable Rack wtth Porcelain Insulators



Detailed View Metropolitan Oil-Filled Cable Joint

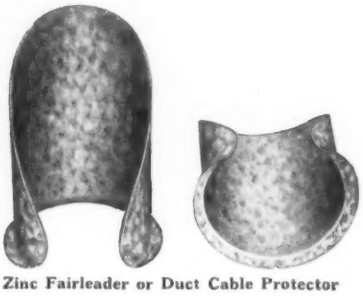
How About Spring Distribution Requirements?

Now is the time to check up your cable needs — racks, junction boxes—supports—measuring devices, etc.

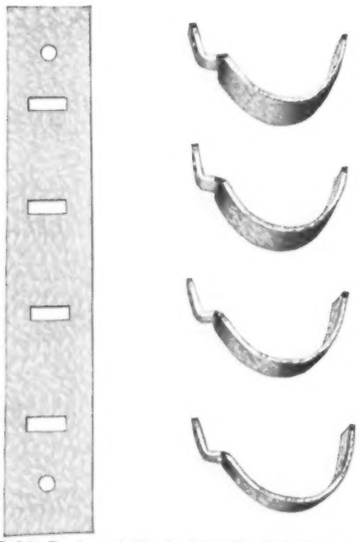
Get our prices and the recommendations of our engineers before placing your order. Let's co-operate.

Metropolitan Device Corp.

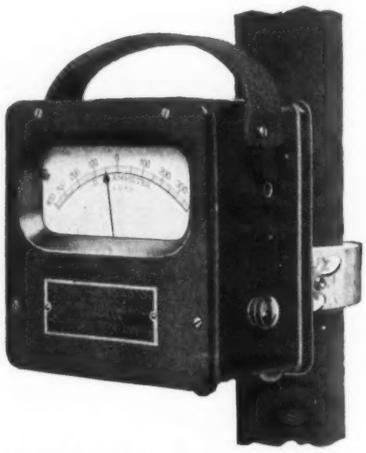
Brooklyn, N. Y.



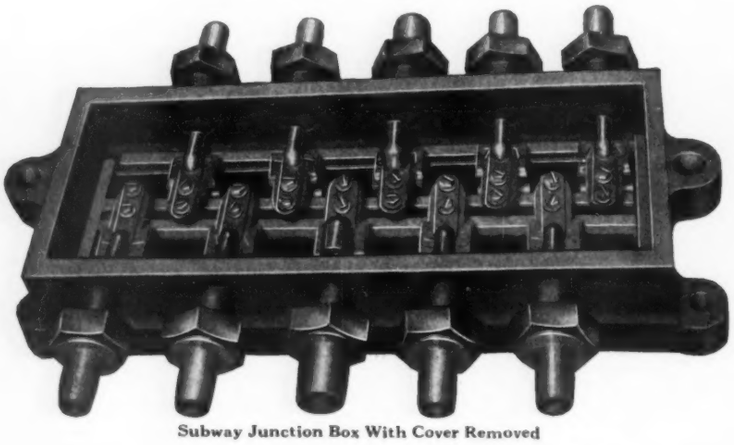
Zinc Fairleader or Duct Cable Protector



Cable Rack and Hooks Heavily Galvanized



Method of measuring current in cable with No. 70 ammeter (side view)



Subway Junction Box With Cover Removed

Metropolitan Six Stub Subway Junction Box

Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

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Broadcasting Over the Wires!

GREAT interest has been created by the recent announcement from General Squier of a new device to broadcast entertainment over the electric light wires. Electrical men are eagerly discussing it. To the public it comes as a new manifestation of the wonders which the future seems to promise in the field of communication. It suggests a startling innovation in the service of the central station and possibly, also, of the telephone company.

Naturally our minds turn first to the technical aspects of the situation. But, looking beyond all the debatable engineering obstacles and possibilities, there is one fundamental fact that we must keep prominently in mind.

THE world has gone wild over wireless. True. But when you come to analyze it, it is not radio that so interests everybody, but broadcasting. Wireless telegraphy and wireless telephony, through the years of their development, have ever appealed to the popular imagination as scientific marvels. But this meant nothing to the ordinary life until the idea of broadcasting was conceived. Radio was a science. Broadcasting is human. It is something to play with, something to enjoy, and it has swept the country in a wave of growing popularity.

So the people want broadcasting and they are getting it. Everybody has been wondering how the ether is to be policed with all these concert, lecture and news programs floating through space, to say nothing of the deluge of wireless political eloquence that is beginning to radiate from Washington. Nobody knows just how all this free entertainment and advice is to be paid for. But nevertheless the demand for more is clamorous, and radio receiving sets cannot be manufactured fast enough to fill the orders that pour in from town and country.

Now comes the next step—wired wireless—and the recognition that the power and telephone lines themselves will distribute entertainment broadcast. And, realizing that after all it is not radio that the people want but merely broadcasting, this thought logically follows: Why not enter this new field with a new service over the existing wire systems and develop broadcasting as an additional source of profit for the public utility?

HERE are our great existing utility systems—already capitalized, already organized, already in physical contact with millions of homes. If these households want broadcasting, why not make this a great appealing service from the public utility, winning friends for every central station? Let this entertainment travel to connected homes along the wires, and to the rest by wireless. There is market enough for all. And the bigness of the opportunity will pay the cost of all the engineering effort needed to prepare the way.

John Edward Jennings

Engineer and manufacturing executive, a pioneer and specialist on transmission-line structures.

FROM the early days of high-tension transmission, when steel structures first came into prominence for this character of service, to the present time years of study, experiment and development have elapsed. Specialists have come forward, men who not only were engineers but who had a proper appreciation of the necessity for continuity of electric service. Prominent among those who have contributed to the development of the industry in the economical adaptation of structural steel to high-tension systems is J. E. Jennings, vice-president and chief engineer of the Milliken Brothers Manufacturing Company of New York. In 1907 the Great Western Power Company adopted his design for a double-circuit steel tower for a portion of its system. This marked the entrance of Mr. Jennings and his company into the electric power transmission field.

Born in Brooklyn, N. Y., in 1875, young Jennings went to public school until fifteen years old, when he started work in the construction department of a large Eastern railroad. At the same time be continued his studies at Cooper Union, from which he was graduated in 1896. With his railroad structural experience for a background, he then began a career of more than twenty-five years devoted to technical structural steel work, during the last fifteen of which he has specialized in transmission-tower development. In this time he has personally supervised the design and manufacture of steel towers for use on thousands of miles of high-tension transmission systems operating now in almost every quarter of the globe.

The strictly technical phases of Mr. Jennings' activities have brought about many economies and practical advances in tower design. His original method of arriving at a safety factor by increasing by a suitable percentage the calculated actual field forces arising from climatic and mechanical conditions of service has become the general practice of many large power companies for obtaining the test loads to which a full-size tower must be subjected. His design work has embodied many original features concerning the economic relation of sag, wire stress and span.

As an expert in transmission structures, Mr. Jennings has been employed in a consulting capacity by a number of large power companies and syndicates as well as by the government of Norway. His work in connection with tower design for the Norwegian authorities called him from the United States in 1920 and resulted in a trip around the world for transmission-line study, inspection and business in an engineering and contracting capacity for his company. His travels led him as far as Australia, where his skill as a designer will soon be evident in a 100-mile line extending from Melbourne to the Morwell brown-coal fields, which are to play a large part in electrical development.

Mr. Jennings has been active in the technical branch of electrical and engineering development closely affiliated with transmission structures. He designed the radio towers in use at important wireless stations in many parts of the world. Here as in his transmission-tower work he has striven to reduce his designs to a general standard permitting recognition of the peculiarities of each system.

Editorial Comment

Electrical World, April 22, 1922

Volume 79 Number 16

No Alarm Over the Coal Situation

ONE aspect of the present coal strike which stands out most prominently is the public's lack of interest. For three weeks production has been at a standstill in union and non-union mines. Even the output of those non-union mines whose men have not gone out has fallen far behind the estimate because of lack of orders. Thus the surplus stocks will dwindle faster than anticipated and the price of coal will rise if the strike doesn't terminate within a reasonable time. Electric public utilities need not become alarmed on that account, however. If the strife is permitted to run its course unhampered, their storage bins will probably still have coal in them when the end comes. What must be avoided are feverish assaults on limited coal reserves. Clamorous buying offers too much of an inducement to gougers, who, being opportunists, may be relied on to ply their trade. The records show that electric public utilities have greater stocks of coal on hand now than they had during the trying periods of 1917 and 1920. Naturally we deplore the losses and waste due to industrial strife. All thinking men do. Yet so long as these cannot be checked lawfully we must of necessity bear them patiently. When the public refuses to be stampeded strikes have a habit of terminating themselves very rapidly. Let the miners and operators fight this out alone, and drill, pick and shovel will soon be at work again.

Attempt to Limit Jurisdiction of Federal Courts

THE Bacharach bill, now in the hands of the House judiciary committee, demands attention. Its purpose is to limit the jurisdiction of the federal courts over orders made by any state public utility commissions. Although it does not go so far as to permit the determination of rights by bureaucratic fiat, it nevertheless aims to shut the doors of the federal courts to public utility corporations notwithstanding that all other corporations have free access to those august tribunals. The Bacharach bill is particularly objectionable to those men who command capital and are willing to invest it for public use where conditions are such that they can see safety for their investment. These men look to the federal courts, and rightly so, to protect inalienable personal and property rights, guaranteed to them by the Constitution of the United States. Our federal judicial system has been in existence now for one hundred and thirty years, and it is a truism that reverence for civil institutions and confidence in their effectiveness, protection and security depend, among the people at large, in greatest measure, on their antiquity or past duration.

Federal judges are appointed for life and are thus removed from temptation and wrong influences. Great care is exercised in their selection, so that none but scholarly, competent, industrious, impartial and incorruptible men are chosen. To deny public utilities access to federal courts, presided over by judges not easily swayed by popular prejudice and clamor and with an eye single only to do justice, is a great wrong. The industry holds public utility commissions in high esteem and is the last to wish to shake public confidence in them. It seeks to strengthen, not to weaken, commission regulation. Nevertheless, however much commissions may be inspired by commendable impulses, they are subject to the possibility of erroneous judgment. An appeal to the federal courts from such decisions makes for efficiency and expedition in the administration of justice, certainty and security to litigants and satisfaction and confidence on the part of the public. Such procedure should therefore be encouraged and not discouraged, and any measure which has not that end in view should be defeated.

The Trade Association and the Hoover Plan

REPRESENTATIVES of the trade associations—those of the electrical industry included—met with Secretary Hoover last week to consider the invitation of the Department of Commerce that their statistics be cleared through the department and made public to remove all possible suspicion that these industrial groups are conspiring against their customers—the people. The meetings were for discussion. No effort was made to pledge the associations to the plan then and there. Two questions, formulating implied objections, were asked by the association men both in the hall and about the hotels: "What advantage will the association member have over the non-member, if statistics are made public?" and "What will happen when Hoover goes?"

The answers to both are easy. Out of about two thousand trade associations operating today in the United States only seventy to eighty are open-price associations. As Secretary Hoover says, the legality or illegality of all forms of such price comparisons has never been definitely established, but it is clearly not in the public interest for competitors to fix their prices in secret. It is in effect a conspiracy against their customers—the public. It is this practice by the few that has cast suspicion upon all. The trade association can and should be lifted out of this "twilight zone" by the publication of all the cost and production statistics which it gathers. And its membership need not feel aggrieved. For if 1,900 associations find good and profitable work of other kinds to do, surely it will not require a great deal of imagination to find ways to make membership in any group worth while. The real function of such a body is to act as a virtual high school to the smaller business units of its industry.

Big companies can take care of themselves, but the small concern needs education in trade practice and aid in the development of the common opportunity. Here is the place for the trade association to render service.

As to what will happen when a new administration installs a new secretary in the Department of Commerce —there is no menace in that. If the trade associations do not like the tone of his voice or the color of his hair, they are quite free to withdraw from the arrangement. Mr. Hoover is not demanding the submission of trade statistics to his department. He is expressing a willingness to act as a clearing house and raise the trade associations above suspicion. If they voluntarily take advantage of this offer, they can likewise voluntarily cut off this relationship with the government whenever they desire.

Why Crack Nuts with a Trip Hammer?

THE manager of the small plant often listens with weary doubts to the story of methods used for organizing the operation of a big central station or conducting its business affairs. He feels, and there is some reason, that he cannot possibly undertake the systematic refinements about which he is hearing and is altogether discouraged at the possibility of trying. Now, it is perfectly true that there are many details in operation and management practicable in the case of a large plant which are utterly out of the question for the man who is operating in a small city. It is, after all, merely a matter of business. A company with a small yearly output cannot afford to spend the time and money which would be entirely justified by and adequate for an output ten times as great. In fact, we have little doubt that some fairly large plants are spending more on inconsequential details than their value justifies. To return to the small station, there is need, on the whole, for more careful watching of the power plant than exists in the case of a big plant, simply because the size of the small plant stands intrinsically against the highest economies, while it can perfectly well make a greater percentage of improvement than its big brother.

Take, for example, the matter of thermal efficiency in the generating station. The plant of a few thousand horsepower does not justify the array of automatic apparatus and records which would be worth while for a very much larger output. It can, however, do substantially the same things in simpler ways which would not be easy on a large scale. It can watch its coal and water consumption, its flue-gas temperatures and its hourly output without putting unreasonable burdens upon anybody, and from these it can very quickly find out where, if anywhere, the plant is failing to do its duty. It does not need a card catalog of every conceivable operation which goes on in its distribution department, but it is perfectly able to keep simple and straightforward records of output and of services, of lines run and lines discontinued, without extra clerical help or loss of valuable time. It can conduct its business in a manner just as orderly as the biggest of central stations, but by methods of inherent simplicity. There is no need of installing a pressure oil system for lubricating a sewing machine, and this homely example typifies the difference between things which should be done by large methods on a large scale and those for which the simplest means are not only adequate but reasonable.

If the manager of a small plant will take the system used by a big one and ask himself not how these things are done but what are they really designed to accomplish, he will find his puzzles gradually disappearing. Thermal efficiency, electrical efficiency, systematic and well-ordered distribution can be and should be found in every plant, big or little; but each must work out its salvation in its own way, suiting the most easily attainable means to the common end.

Correlation of Resistance and Breakdown Strength Would Be Welcomed

OF THE principal constituents of electrical machinery the greatest improvements of the future are to be looked for in the insulating materials. The problem, however, is one of the most baffling with which the manufacturer and investigator have ever had to contend. It appears safe to say that more time and effort have been expended on the study of insulation than on that of either iron or copper, yet our knowledge and our ability to control the former are far less definite than is the case with either of the latter. However, with increasing appreciation of the importance of the problem and recognition that its extreme complexity demands time, patience and careful study for its proper understanding, there is already beginning to appear from recent investigations a semblance of orderly relation between the physical properties of insulation and its behavior under electric stress.

For many years it has been generally accepted as an approximate truth that the insulation resistance as measured in megohms has little relation to the electric strength or breakdown voltage. The former test is used practically not at all for machinery, and the latter is used rather for the purpose of detecting weak points unavoidable even in the most careful manufacture than as an indication of the real electric strength of the perfect material. As is well known, the voltage test really lowers the initial electric strength of the insulation by the excess stress imposed. If reliable conclusions as to electric strength could be drawn from the value of the insulation resistance, the latter measurement would then undoubtedly rapidly supplant the former.

Several recent researches have brought out clearly certain parallels between these two properties. As regards the influence of both moisture and temperature, there is now substantial evidence that resistance and breakdown strength go more or less hand in hand for many types of manufactured insulation. The importance of the elimination of moisture has long been recognized, but its study and pursuit to the smallest quantities, as exemplified in the work of Evershed of a few years ago, has led to a far more exact knowledge as to the nature and laws of the conducting paths through the material. These laws, although as yet vague, already lead to conclusions on breakdown that are in good agreement with observation.

Similarly as regards temperature. Failure to realize the importance of an initial heat treatment for expelling moisture has often prevented proper recognition of the influence of temperature. Carried beyond this point, however, there is good evidence that a definite relation between insulation resistance and electric strength may be expected. A recent contribution in this field is the

paper by W. S. Flight in the *Journal* of the (British) Institution of Electrical Engineers, in which is shown the influence of temperature in lowering the electric strength of those materials in which it is most difficult to eliminate moisture. The way is still long, and the difficulties are many and discouraging, to complete knowledge and control of the fibrous and flexible materials necessary in manufacture; but the work goes on and progress and improvement continue always.

Open-Delta Operation Has Its Advantages in Serving Growing Loads

WITHOUT going into the relative merits in regard to general operating conditions of closed-delta and open-delta transformer banks, which are dependent on many outside factors such as switches and throwover, it must be recognized that savings in energy losses are possible by open-delta operation. The applications of such operation are innumerable and the possibilities of accomplishing it are many. Wherever single-phase transformers handle three-phase load possibilities of such saving are present. Its magnitude will depend on the load factor and on the peak load carried. In this issue Merrill De Merit gives two examples of what can be expected from open-delta operation and points out the value of investigating all cases where open-delta application is possible. Although it is evident that the cost of energy saved is relatively small, as it is off-peak energy, the amount of energy saved will probably be large in many systems. Moreover, an improvement in power factor is possible at low load which would result in reducing losses at other points on the system, particularly in the overhead and underground lines, where, because of very bad power factor, large losses often occur at low-load periods.

Developing Purchasing Power in Customer-Ownership Campaigns

THE Central Maine Power Company's vigorous customer-ownership campaign during the past three years is noteworthy in several respects. Some three million dollars' worth of preferred stock has been absorbed in the territory served since intensive sales methods were adopted, and a potent stabilizing influence upon public sentiment has been created. Not through "propaganda" advertising but by an appeal to the people of Maine to unite with the company in building up the state has come a surprising amount of help in establishing private ownership upon a rock-bottom foundation. The soil of the Pine Tree State is, therefore, at the present time about as poor a seeding ground for state development of electric utilities as can be found in this country.

Only through intensive selling plans has the Central Maine company been able to accomplish so much. These plans have been developed along somewhat different lines from those ordinarily followed by banking houses seeking to place securities in the smaller cities and towns. With the utmost care the purchasing possibilities of the entire field, including remote hamlets, isolated farms and cities, were analyzed, and then the local newspapers were utilized with admirable advertising skill.

Instead of looking upon small towns and rural districts as potentially capable of absorbing only a comparatively few shares of company stock each, the Central Maine staff, through competitive selling and by persistent occupational marketing of the company's stock, has gone literally into the highways and byways, convinced the shrewd Yankee population of the desirability of sharing in the electrical development of the state in competition with outside investments, and achieved a truly enviable record. That people of small and moderate means can be sold securities of this sort when the proper methods are used signifies much to the believer in future good relations between the money-saving public and the companies supplying the essential services of which electricity, whether for light or for power, is the carrier and developer.

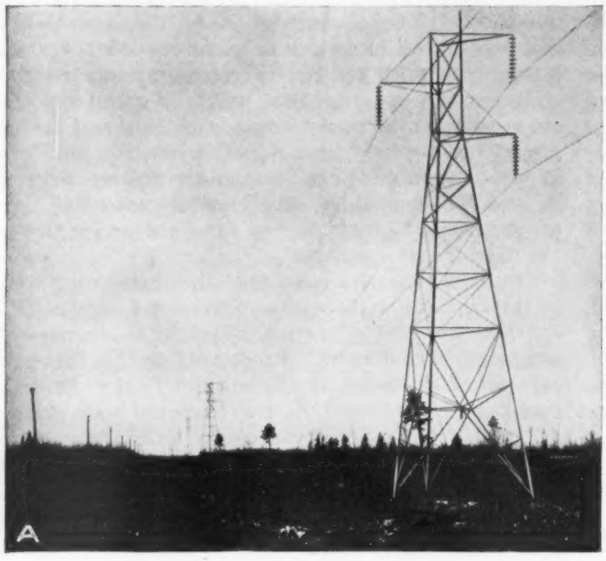
The man who has conducted this campaign presents in this issue a well-rounded, clear-cut program for the organization and operation of such a security-selling campaign to customers. Predicated on this three years' experience in Maine, it offers a practical guidance that may well be followed in the planning and promotion of similar public utility security campaigns in other communities, particularly where the population is small.

The Engineer and the Human-Relations Problem

A FIRM belief in the unlimited possibilities of science and the ability of the engineer to produce food, shelter and clothing for the race was recently voiced by Dexter S. Kimball, president of the American Society of Mechanical Engineers and dean of the Engineering School at Cornell University. He was not so sanguine of the ability of the engineer to see and appreciate the human-relations problem which has arisen as a result of the extension of mechanical developments into every phase of industry and home life —an extension that has produced an intense specialization of labor and because of which the worker no longer owns the tools of industry. Although engineering has become synonymous with ability to do things and industry is becoming to be largely administered by engineers, Dean Kimball said that the effort of the engineer seems to have stopped at the point where the accomplishment of physical results is complete.

Written into our national charter is the declaration that every individual is entitled to life, liberty and the pursuit of happiness. Nine-tenths of happiness lies in the establishment of proper relations with others. Without such relations all the mechanical progress imaginable cannot make for development of the human race. With such relations established the greater the mechanical progress the greater the happiness of the human family. If, as Dean Kimball has said, the engineer has been extraordinarily blind to this phase of his problem, it is perhaps due to the tremendous pace in mechanical development that has been maintained for several decades past. However, the time has arrived when he can no longer afford to be blind. In no field is this thought more applicable than in the electrical, and particularly in the public utility portion of that field. It is gratifying to note that in the various conventions, through all the discussions, runs a note that puts the wellbeing of the public at the forefront in solving engineering and business problems. There is little need to worry about the ultimate awakening of the engineer. He is already yawning and stretching, at least; but it is desirable for him to hasten the awakening process a little.

Michigan System Comprises 1,300 Miles of Transmission Line, of Which 526 Miles Is 140 Kv.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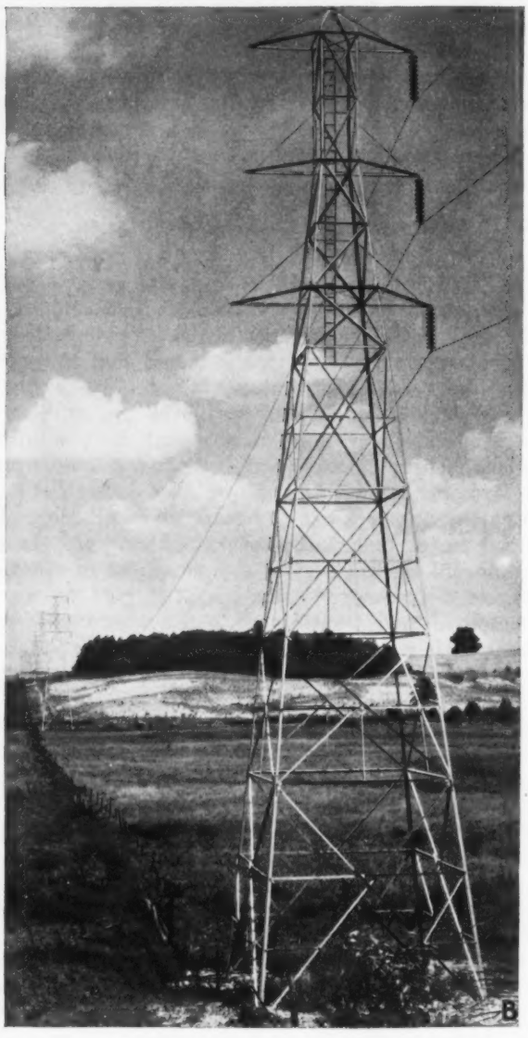
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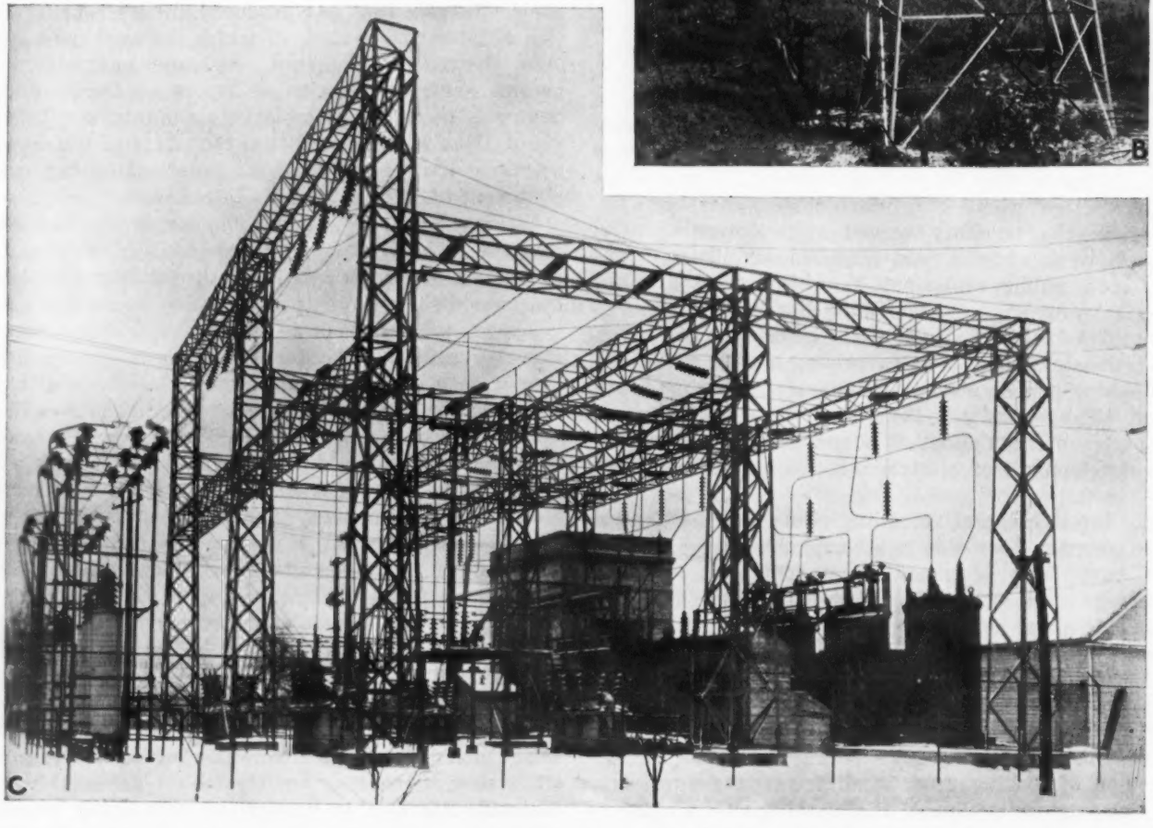
STARTING operation of its 110,000-volt lines in 1907 and now having 526 miles of 140,000-volt line joining thirty-one steam and hydro-electric generating stations, the Consumers' Power Company of Jackson, Mich., ranks as a leader in high-tension interconnection. The nature of the country over which the lines are run and the construction of the towers are indicated in illustrations A and B. C is an outdoor switching station at Muskegon.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Thirty-one Hydro and Steam Plants Joined by 140-Kv. Lines in Michigan

Thirteen Hundred Miles of Transmission Line Involved, of Which 526 Miles Is of the Above Voltage—Eleven Years' Experience Has Justified the Line Construction Employed

By HARRY J. BURTON* and WILLIAM W. TEFFT†
Consumers' Power Company, Jackson, Mich.

AN EXCELLENT test of the value of interconnection in assuring continuity of service was afforded on the Michigan system during the sleet storms of the winter just past. These storms proved to be the most severe in the history of the State. Railroad schedules were canceled for two or three days, telephone and telegraph traffic was disrupted, trees were stripped of branches, and rain froze on wires to a diameter of 2.5 in. (6.3 cm.) and formed as many as five 7-in. (17.1-cm.) icicles to the foot on conductors. Although even the rugged steel transmission towers crumpled in some places and conductors broke in others, more than 99 per cent of the service was maintained uninterrupted. No interruption that did occur exceeded fifty-seven minutes. The authors feel that this record is one deservedly to be proud of, considering the fact that more than 1,300 miles (2,090 km.) of transmission lines was involved, joining thirty-one widely scattered generating stations‡ and about fifty substations. Of this mileage 526 miles (846 km.) consisted of 140-kv. lines. Furthermore, nearly half of the energy consumed in the system is generated by water-power plants situated chiefly at points remote from the market.

More Than 500 Miles of 140-Kv. Transmission System

The transmission system is divided into two parts by reason of the use of 30 cycles in the western portion of the peninsula and 60 cycles in the southern and eastern portions. The two parts each have main transmission at 140 kv., and they are tied together through a 15,000-kva. frequency changer at the Elm Street plant in Battle Creek. A 5,000-kva. frequency changer tying the two frequencies together on the lower-voltage transmission lines has been in operation since 1915 at the Kalamazoo plant. The section of the 140-kv. transmission line from Owosso to Lansing and Battle Creek has been changed from 70-kv. to 140-kv. operation in the past year, and a new section of 140-kv. line from Battle Creek to Argenta has been built to bring the 30-cycle system into Battle Creek for tying the two frequencies together. The transmission distances range from 40 miles to 250 miles (64 km. to 400 km.) and the power transmitted per circuit amounts in some cases to as much as 25,000 kw.

Previous to 1907 the transmission voltages did not exceed 70 kv. In that year the Croton-Grand Rapids line, about 40 miles long, was designed and built for 110-kv. operation. The distance from the Au Sable and Manistee River power sites to the power market was such that this voltage would not economically transmit the power available. In 1910 the first 140-kv. lines were designed and the construction undertaken, the circuits being put in service in 1912.

The present standard construction consists of single-circuit and double-circuit towers in standard and corner types and medium, heavy or tripod anchors as required. The single-circuit tower heights are such as to give either 40, 50 or 60 ft. (12, 15 or 18 m.) from the lowest wire to the ground, while the double-circuit towers give a clearance of 40 ft. (12 m.) from the conductor to the ground and 10, 20 and 30-ft. (3, 6 and 9-m.) extensions for either the standard or corner tower are provided. All construction that cannot be handled with this assortment of towers is treated as special, and designs are worked out in each case to fit conditions.

Steel-Tower Difficulties Encountered and Overcome

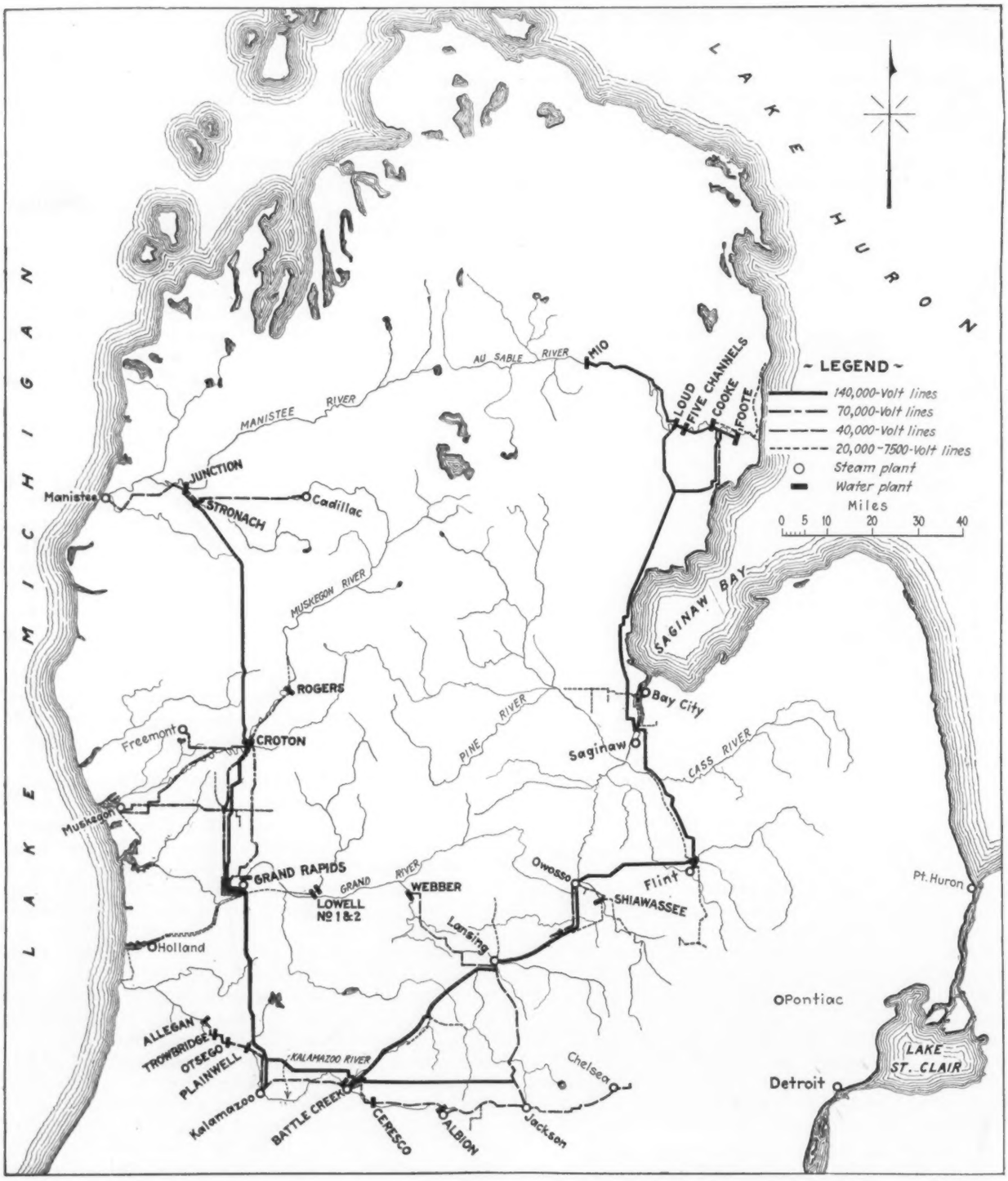
The single-circuit tower is a three-post type with triangular conductor arrangement. For the Croton-Grand Rapids line, which was only a step toward the design of the 140-kv. lines, the tower was modeled after an older pin-type tower. The three legs ran to a peak at the top of the tower and a ground-wire connection was provided. In passing it is interesting to note that, owing to adverse experience with ground wires on other lines, this ground wire was never installed. In the later designs the tower was modified to bring the legs within 4 ft. (1.2 m.) of each other at the bottom cross-arm, providing the stiffer design needed when subjected to torsion and to stresses caused by conductor breakage.

The vertical spacing which was allowed between adjacent wires was 8 ft. (2.4 m.) and the horizontal spacing between wires on the opposite sides of the tower slightly more than 13 ft. (3.9 m.). Under certain conditions, when snow or sleet melted off the conductors, trouble due to the lower wire swinging up and short-circuiting the conductor above it was experienced. This occurred when the sleet fell off a single span, leaving the adjacent spans loaded. The vertical spacing for the 140-kv. towers was increased to 12 ft. (4.2 m.). The horizontal spacing was increased to 16 ft. (4.8 m.) to increase the clearance between the conductor and the tower leg from 5 ft. to 6 ft. (1.5 m. to 1.8 m.).

The older pin-type line towers were equipped with a tripod-type anchor. The designs for the Croton-Grand Rapids line provided for anchors constructed of a single galvanized-steel angle about 8 ft. (2.4 m.) long riveted about 1 ft. (0.3 m.) from the lower end of the leg. This was then covered with concrete molded in the form of a mushroom. The expectation that this form of con-

*Director of educational department.
†Consulting hydraulic and civil engineer.
‡Features of some of these plants were presented on page 329 of the Feb. 18, 1922, issue.

struction would prove cheaper than the tripod anchors previously used was not realized as the difficulty in forming the concrete was greater than anticipated. Later experience indicated that the protection against corrosion given by the concrete was not needed, and the tripod type of anchor was retained in later designs. In the earlier lines no distinction was made between corner and straight-line towers, nor was there any attempt made to accommodate tower locations to the topography of the country. A uniform spacing of ten towers per mile was used. It was found that the use of one type of tower was not satisfactory. Two were then developed, one for use for straight lines and for deflections not in excess of 11 deg. The other was designed for angles up to 45 deg. and at railroad crossings. The design of the standard tower is based on the assumption that the tower need be no stronger than the conductor. The tower stresses are allowed to reach the assumed elastic limit of 32,500 lb. per square inch (2,275-kg. per sq.cm.) at the same time the conductor stresses reach that point. For the copper used this value is assumed at 35,000 lb. per square inch



TWENTY HYDRO-ELECTRIC AND ELEVEN STEAM GENERATING STATIONS ARE INTERCONNECTED BY THESE TRANSMISSION LINES

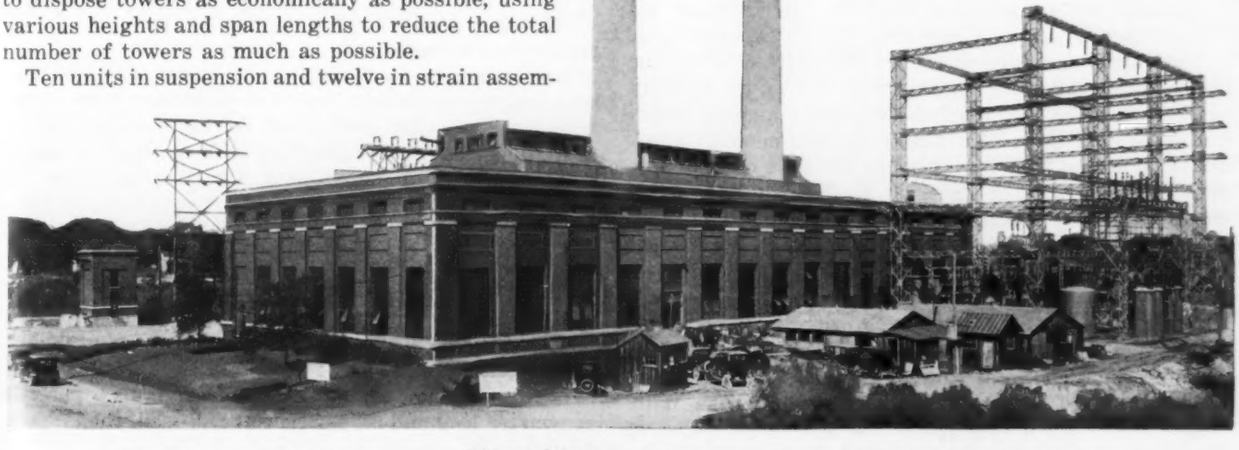
(2,450 kg. per sq.cm.). Eleven years of experience has shown few failures except those caused by conditions against which the designer is helpless, and the assumptions may therefore be considered justified, since they produce a most economical tower design. The corner tower is designed for greater assumed conductor stresses and the stress in the steel is limited to 25,000 lb. per square inch (1,750 kg. per sq.cm.). The three-post single-circuit tower has shown decided advantages due to economy in anchor settings, perfect anchor alignment and economy in total weight.

TOWER CHANGES REQUIRED FOR DOUBLE CIRCUITS

The necessity for double-circuit towers brought a design using a four-post tower with two cross-arms one above the other. Each cross-arm supported one circuit with three wires in a horizontal phone. Trouble on the upper circuit interfered with the operation of the lower one and at best made repairs on the upper one hazardous. A second design reverted to the three-post type with cross-arms and one circuit on each side of the tower. It was soon found that the advantages of the three-post tower for single circuits did not hold for the double-circuit type, because the combination of increased height and load produced an uneconomical design in that portion of the tower immediately below the lower cross-arms and imposed too great a duty on the anchors. A four-post tower was then designed for use on the 140-kv. transmission line from Grand Rapids to Kalamazoo. Three cross-arms were provided for the location of a circuit on each side of the tower with a vertical spacing of 12 ft. (4.2 m.) and a horizontal spacing of 16 ft. (4.8 m.). Later, when it became necessary to use a heavier conductor, the design was strengthened by increasing the dimensions of such members as were overstressed. Particular care was taken to retain the bolt spacing and connection details of the older design so that the two should be interchangeable and repairs facilitated and made more economical. The tripod type of anchor is standard for all towers except those under special conditions where the heavy loads carried require a special design and the use of concrete. In good soil these anchors are buried in the ground. If conditions are poor, a small amount of concrete is placed around the bottom of the anchor, and in very unusual circumstances piling may be employed under each anchor. In the later designs the utmost care is taken to dispose towers as economically as possible, using various heights and span lengths to reduce the total number of towers as much as possible.

Ten units in suspension and twelve in strain assemblies are used on all the 140-kv. lines. The Hewlett-type suspension insulator was used on the first 110-kv. lines. At that time no regular hardware was available, and the deficiency was supplied by using an annealed piece of line wire connected with Crosby clips. This arrangement has proved satisfactory for a good many years of service, though now a good many breaks are beginning to develop. The system has probably experienced about the same difficulties that have been met elsewhere.

The conductors employed on the Croton-Grand Rapids line consist of six strands of No. 10 medium hard-drawn copper, making a conductor a little less than No. 2 in copper content, but an over-all diameter slightly less than No. 1. The combination was selected for purely manufacturing reasons. A hemp center was put in the conductor and caused considerable localized corona, so that it is probable that the increased diameter of the conductor did not greatly reduce the corona loss. In the fall of 1908 the General Electric Company made some corona tests on this line. When the 140-kv. lines were designed in 1910 there were hardly any other data available on this subject. On the strength of the tests it was decided that No. 0 stranded conductors would be the smallest it was advisable to use. These were made up of seven strands of copper instead of the six strands of copper and one of hemp in the conductors on the older line. Because of the high stress to which the wire was to be worked to obtain the largest possible ground clearance and the longest possible spans with 40-ft. (12-m.) towers, the specifications were very rigid. Particular care was taken to specify a tensile value that will give maximum strength with a minimum of brittleness. The avoidance of small kinks by drawing the wire from the dies upon solid spools was insisted on. Each length was to be about 5,300 ft. (1,590 m.) long and no joints or braces of any kind were permitted. Rather interesting light was shed on the conductor question when just after the conference regarding conductor specifications some difficulties of other transmission companies with brittle hard-drawn copper became evident. This strengthened the belief that, in spite of the manufacturing difficulties involved, the rather rigid specification was justified. The conductor now used is No. 00 A. W. G.



EASTERN AND WESTERN HALVES OF 140-KV. SYSTEM JOINED BY FREQUENCY CHANGER IN THIS STATION

This steam generating station, which is situated at Battle Creek, Mich., is thoroughly modern, having been completely remodeled recently. It is rated at 27,000 kw. and contains a 15,000-kva. 60/30-cycle frequency changer.

Economy of Open-Delta Operation

In Growing Industries Two Transformers May Serve Load for Some Time, Thus Postponing Purchase of One Transformer—Condition When Third Unit Is Necessary

By MERRILL DE MERIT*
West Penn Power Company, Pittsburgh, Pa.

STATEMENTS from different sources have indicated a prejudice, in some places at least, against open-delta operation. It cannot be denied that in many cases the open-delta arrangement of transformers is very unsatisfactory, both as to economy and to service. However, the conditions which govern different cases vary widely and economical considerations indicate that the open-delta bank for transforming three-phase power has some applications. Frequently the conditions of operation on power transformers are such that a three-phase bank is underloaded for a great period of time. This is especially true of transformers which accommodate growing industrial loads where the customer takes primary current, because the open-delta arrangement reduces his original investment about one-third, and he can increase his transformer capacity by inserting the third transformer.

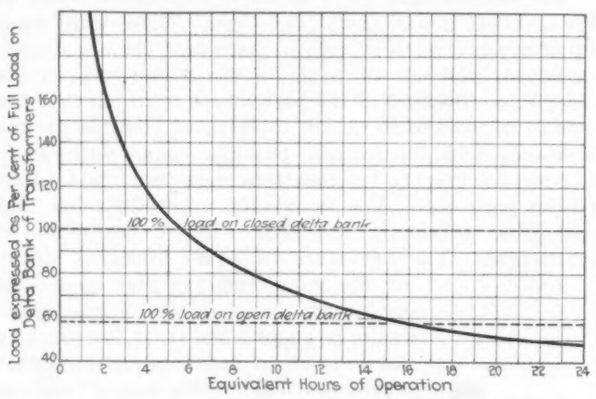


FIG. 1—LOAD OF EQUAL ECONOMY FOR OPEN-DELTA AND CLOSED-DELTA BANKS OF TRANSFORMERS

If, for instance, the equivalent hours of full load operation are ten and the load is 50 per cent open-delta operation is economical.

The third transformer should be inserted when the load becomes too great for the original two, or, possibly sooner, when the load reaches some other amount determined by economy. Naturally the economical determination would take into account the cost of transformers and the cost of energy. Each case in practice would therefore require a special solution. The more general problem will be handled here; that is, only the economy with respect to energy losses will be considered. When the open delta arrangement is being used the exciting current on the third transformer is being saved. The copper losses are greater than with the closed delta for the same load, and so at higher loads would offset the advantages of lower excitation loss. The daily copper losses are a function of the equivalent hours of operation at maximum load, so that in determining the load at which it would be economical to cut in the third transformer it is essential to take these into consideration. This load for any number of equivalent hours may be readily computed from the data ordinarily furnished with each transformer, *i.e.*, the quarter-load efficiency and the full-load efficiency.

The derivation of the general equation for determining the point at which economy changes from closed-delta to open-delta operation follows. It is assumed that the load is balanced.

I_f = transformer current at full load.
I_l = line current at full rated load of closed delta bank.
I_e = line current of equal economy for closed and open delta connections.
R = equivalent resistance of one transformer.
C = core loss in watts for one transformer.
I = line current at any time.
t_e = equivalent hours of operation per day.

DAILY LOSSES IN WATT-HOURS

Transformer Connection	Copper Losses	Core Losses
Delta	$3\left(\frac{I}{\sqrt{3}}\right)^2 R \times t_e$	$3\,C \times 24$
Open-delta	$2\,I^2 \times R \times t_e$	$2\,C \times 24$

Equal economy will occur when core lossesΔ + copper lossesΔ = core lossesΛ + copper lossesΛ, hence

$$3\left(\frac{I}{\sqrt{3}}\right)^2 R \times t_e + 3\,C \times 24 = 2I^2R \times t_e + 2\,C \times 24$$

Then the critical line current $I_e = \sqrt{\frac{24\,C}{Rt_e}}$, $I_l = I_f\sqrt{3}$ and

$$\frac{I_e}{I_l} = \sqrt{\frac{8}{t_e} \times \frac{C}{I_f^2 R}}$$

where $\frac{C}{I_f^2 R}$ = ratio of core loss to copper loss at full load on one transformer.

This equation, in terms of the known full-load current and the equivalent hours of maximum load operation, gives an easy method of solving for the current that will give equal economy on both methods of operation, open-delta or closed-delta. It is evident that the constant $\frac{8\,C}{I_f^2 R}$ will vary with transformers of different sizes and characteristics.

As an illustration of the application of the equation the problem is worked out for a bank of three single-phase, 200-kw., 6,600/220-volt transformers of known characteristics as follows:

If the efficiency of each transformer is 96.5 per cent at quarter load and 98 per cent at full load, then
At full load

(1) Input = $200{,}000 + I_{f_2}R + C$ watts
Output = 200,000

*Formerly with distribution engineering department, Detroit Edison Company.

$$(1)\ \text{Efficiency} = 98/100 = \frac{200{,}000}{I_{f_2}R + C + 200{,}000}$$

At quarter load

$$\text{Input} = 50{,}000 + \left(\frac{I_f}{4}\right)^2 R + C \text{ watts}$$

$$\text{Output} = 50{,}000$$

$$(2)\ \text{Efficiency} = 96.5/100 = \frac{50{,}000}{\left(\frac{I_f}{4}\right)^2 R + C + 50{,}000}$$

Solving (1) and (2) simultaneously, $C = 1660$, $I_f^2R = 2420$ and $\frac{I_f^2R}{C} = .686$

and the equation for the economy curve becomes

$$\frac{I_c}{I_l} = \sqrt{\frac{5.48}{t_e}}$$

The curve in Fig. 1 is drawn by taking various values of t_e and substituting them in this equation. The curve indicates that with the transformers assumed it would be economical for ordinary types of load to use the open-delta connection at least up to its full capacity. The equivalent hours on most power loads do not run over ten and are usually considerably less—down to four or six for smaller loads. Within this range the curve lies considerably above the full load point of the open-delta bank. However, another point must be taken into consideration here. The regulation of the three phases of an open-delta bank is not the same, even if the load is a balanced three-phase load. That is, at full load the voltage between any two wires on the secondary side is different from the voltage between any other two wires. This difference may be relatively high, depending on the design of the transformer. In cases where it is relatively high it would decrease the efficiency of some of the three-phase machinery contained in the load. Naturally it would not be good policy to fully load the transformers unless the equivalent hours of operation were fairly low. If the load contains no machinery which would be affected by this inequality of voltage this consideration would of course be unnecessary.

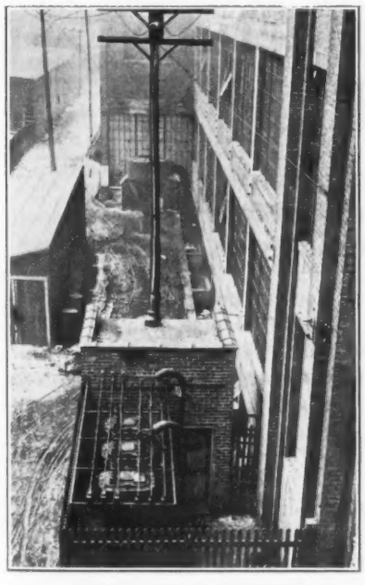


FIG. 2—OPEN-DELTA TRANSFORMER BANKS HAVE PLACE IN SERVING GROWING LOADS

Two 200-kva. transformers in open delta were originally installed to care for this load, which had prospects of growing rapidly. After the load had increased sufficiently the third transformer was added, making the installation shown.

Thus far the discussion has been from the viewpoint of determining the economy of open-delta operation in cases where the load is low and is expected to increase. The object has been to bring out the fact that if there exist advantages of another nature in favor of open-delta operation, then the economy of operation of the transformers so arranged will usually add further advantages. However, the great variety of conditions of load which are shown to be economical by the curve in Fig. 1 may cause one to ask whether it might not be good policy to operate in open delta even in some cases where the other favorable conditions do not exist. Some of these other cases would be where the load on a certain bank of three transformers is cut down temporarily for a considerable period of time. Such conditions of load might be brought about by a dull business period, a curtailment of load by the central station company, or some similar cause. In order to determine whether it would be good policy to disconnect one of the three transformers in a case of this nature it would be necessary to determine the amount that could be saved by the economy thus effected. This would enable one to say just how much trouble or expense would be justified to cut out the third transformer. In order to give a general idea of how much the saving might be under the proper conditions, a curve has been drawn (Fig. 3) between size of transformer and kilowatt-hour of core loss per month. This curve is only for transformers of certain voltages and of a certain design, but, generally speaking, this curve will very closely represent the conditions for any line of transformers designed for general purposes and which are for voltages ordinarily used on power distribution. To facilitate interpretation of this curve in terms of dollars a second scale has been added at the right of the sheet, showing the monthly cost of power loss in dollars for various transformers. The cost of energy used is $0.025 per kilowatt-hour.

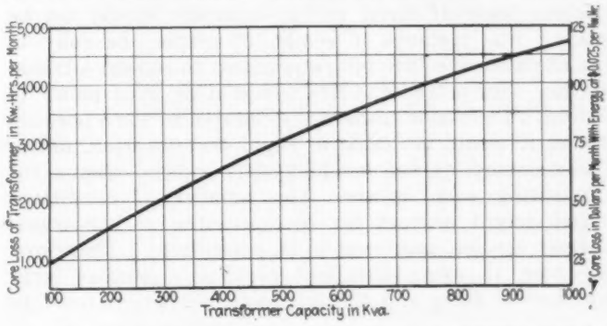


FIG. 3—CORE LOSS PER MONTH AND EXPENSE THEREOF FOR A GIVEN GROUP OF TRANSFORMERS

Refers to 6,600-volt, 60-cycle, single-phase power transformers. Curve shows cost of core loss in dollars per month if energy costs $0.025 per kilowatt-hour.

If the load is well below the critical point the cost of core loss on one transformer represents very closely the saving that would be effected by disconnecting one transformer of a three-phase bank and operating the other two in open delta. The actual saving would be less than the core loss saving for a given period by an amount equal to the increase in copper loss cost on the two transformers during that period. However, since the copper loss varies as the square of the load, and since it is usually about 1 per cent at full loads, it becomes almost negligible at low loads. This is more nearly true since the copper loss endures for only a portion of each day. From the curve in Fig. 3 it is evident that this saving is appreciable, especially with transformers of large capacity. It seems possible that, for the transformers considered, a sufficient saving would be accomplished to warrant the disconnection of transformers as small as 100 kw. for a period of a month. It is also evident that the longer the period of low load the greater the amount which will be saved.

The cost of disconnecting and connecting would not vary, of course, with the length of time the load is low and so, generally speaking, the longer the period of low load is to exist, the smaller will be the lowest size of transformer that can be economically disconnected. Conversely, it might be economical to disconnect one transformer in a large bank for a short period of low load. It is quite conceivable that with the proper equipment available, it might be quite profitable to switch out one transformer for a period of a few hours.

It is not meant to imply that other considerations besides those of strict energy economy should not be made. For instance it would, of course, be folly to install expensive switching equipment to cut out a transformer once or twice. Nor would it be good policy to cut out an out-door transformer located in some position where it would be liable to rapid deterioration, unless the economy gained would justify special means for preventing such injury. The number of conditions which might prevent the disconnecting of one transformer are too numerous to be given here. There are, however, in every electrical problem a similar large number of facts and special conditions which must be taken into consideration in the solution of that problem.

It is meant to emphasize here that the fact which should be taken into consideration in many cases is that the superior economy of open-delta operation over closed-delta operation justifies its use. Briefly, it may be stated that frequently:

1. Where other advantages exist for open delta operation, usually the economy of energy consumption in the transformers adds another advantage.

2. Where the load on a bank of three single-phase transformers is to be low for a considerable period of time, considerable saving can be accomplished by disconnecting one of the transformers and operating the other two in open delta.

3. That where conditions are favorable on banks of three large single-phase transformers it is good policy to disconnect the third transformer and operate the other two in open delta for very short periods of low load.

4. That each problem should be considered with reference to all facts and conditions which affect that problem, and that in all problems due importance should be given to the economy of open-delta operation.

Census of Electrical Manufactures for 1919 Analyzed

Even After Consideration Is Taken of Underlying Economic Conditions, It Is Apparent that Electrical Production Has Made Tremendous Strides, Especially in Energy-Consumption Devices

DETAILED figures of the sales in 1919 of electrical machinery, apparatus and supplies, as compiled by the Bureau of the Census, are now available and are here published for the first time. For comparative purposes corresponding data are given for the census years 1914 and 1919. In this respect, however, a word of caution should be given. Due consideration must be given to the economic conditions that existed in the years taken before making any comparisons. Otherwise one is apt to arrive at unwarranted conclusions.

It must not be forgotten, for instance, that the first seven months of 1914 were pre-war months and consequently more or less normal. During the last five months of that year business, both domestic and foreign, fell off and was almost at a standstill. Prices reflected this condition and as a result were lower toward the close of the year. All told, therefore, the year 1914 was decidedly subnormal and was below those immediately preceding it.

After 1914 a great change occurred in business, particularly in prices. At the opening of 1919 the war had been over only a little more than a month and already there was a depression, with falling prices, due to the cessation of business in munitions. In this fashion the first quarter passed. Then the pent-up desire to spend asserted itself and the entire country was before long engulfed in a wave of unbridled extravagance. Not even at the height of the war were factories so hard pushed to meet demands. Prices soared to record levels in most lines, and the year closed on the crest of the flood of prosperity. Thus the year 1919 was decidedly above normal both in volume of merchandise produced and in the price secured. This was true of the foreign as well as the domestic market.

In order, therefore, to get a true picture of the growth of the electrical manufacturing industry one should really allow a little for 1914 and temper somewhat the 1919 figures.

The tables tell the story better than words. Table I gives the picture as a whole, while the important subdivisions are given in more detail in the smaller tables. There are, however, certain features to which attention should be directed.

The growth in the battery business seems almost unbelievable. This is another indication of the extent to which electric starting and lighting have replaced hand cranking and acetylene for automobiles. The figures also show to what proportions the flashlight trade has developed, as it were, almost overnight.

It is impossible to help noticing the rapid gains made by Pennsylvania manufacturers of switchboards and similar equipment.

The greatest surprise, however, is in the transformer figures. The increase in kilowatts was from 2,644,794 to 14,484,179, while the value increased from $13,120,065 to $25,560,901. The market for large transformers was very active, this being brought about by the great number of interconnections.

Illinois took first place from New York in the production of insulated wire and cable, while New Jersey retained her position in second place. Not only did

TABLE I—ELECTRICAL MACHINERY, APPARATUS AND SUPPLIES—SUMMARY

	1919	1914	1909	1904
PRODUCTS, TOTAL VALUE:	$1,019,060,879	$359,432,155	$240,037,479	$159,551,402
Electrical industry—electrical machinery and apparatus	$997,968,119	$335,170,194	$221,308,563	$140,809,369
Subsidiary electrical products of other industries	21,092,760	24,261,961	18,728,916	18,742,033
PRINCIPAL GROUPS:				
Generating apparatus and parts	$86,266,114	$17,865,542	$14,077,071	$11,084,234
Transformers and feeder potential regulators	53,495,570	28,276,338	14,630,715	7,142,026
Motors (not including starters or controllers)	116,893,638	44,176,235	32,087,482	22,370,626
Electric locomotives, mining, industrial and railway	8,159,825	3,720,914	(1)	(1)
Batteries, storage	60,036,152	13,080,964	4,678,209	2,645,749
Batteries, primary	32,427,043	10,321,491	5,934,261	1,598,144
Carbons—furnace, lighting and welding; brushes, battery and miscellaneous	13,291,615	3,602,741	1,934,864	2,710,935
Arc lamps	606,771	742,142	1,706,959	1,574,422
Searchlights, projectors and focusing lamps	4,342,246	2,081,545	935,874	114,795
Incandescent lamps	57,646,900	17,350,385	15,714,809	6,953,205
Rectifying apparatus, including rotating commutators, electric valves, mercury rectifiers and vibrating commutators	1,964,876	147,965	*	*
Telegraph apparatus	12,816,341	2,248,375	1,957,432	1,111,194
Telephone apparatus	46,214,342	22,815,640	14,259,357	15,863,698
Household and industrial apparatus and devices	54,793,195	4,048,915	1,954,112	395,827
Electric measuring instruments	19,322,164	8,786,506	7,800,010	5,004,763
Magneto-ignition apparatus	51,286,793	22,260,847	6,092,343	678,077
MISCELLANEOUS ELECTRICAL MACHINERY, APPARATUS AND SUPPLIES:				
Switchboards, panelboards and cut-out cabinets for light and power	17,735,780	8,989,111	5,971,804	3,766,044
Railway switches, signals and attachments	4,466,611	†6,393,551	†5,377,843	†1,451,337
Circuit breakers, oil	2,733,535	‡	‡	‡
Circuit breakers, air and carbon	1,391,911	‡	‡	‡
Fuses, cutouts, and fuse plugs	7,895,098	1,757,430	1,001,719	868,079
Insulators	6,504,147	‡	‡	‡
Sockets, receptacles, bases and attachment plugs	15,008,365	5,512,609	4,521,729	2,010,860
Wiring supplies (current carrier)	6,857,819	‡	‡	‡
Lightning arresters, choke coils, reactors and other protective devices	2,353,416	1,188,773	940,171	587,124
Insulated wire	53,302,821	69,505,573	51,624,737	34,519,699
Insulated cables, rubber insulation	15,576,247			
Insulated cables, paper insulation	15,337,853			
Pole-line hardware	9,379,145	‡	‡	‡
Circuit fittings not elsewhere provided for	5,052,994	2,067,683	1,080,287	352,544
Underground conduits	890,749	4,874,709	5,098,264	2,416,245
Interior conduits	18,375,880			
Electric lighting fixtures of all kinds§	2,703,266	3,383,955	2,200,668	3,294,606
Annunciators and push-buttons	709,941	263,806	235,567	185,870
Electric clocks and time mechanisms	1,797,909	410,774	352,513	373,926
Bells, buzzers and signal gongs	3,616,281	‡	‡	‡
Therapeutic apparatus, including X-ray tubes	8,895,402	2,653,098	1,107,858	1,036,962
All other electrical machinery, apparatus and supplies	95,232,300	27,276,294	18,995,176	26,267,509
All other products	76,573,808	17,951,652	17,765,645	
Amount received for custom work and repairing	27,106,016	5,676,592		

* Figures not available. † Reported as "electric switches, signals and attachments." ‡ Not reported separately. § Not including fixtures made by establishments engaged primarily in the manufacture of "gas and electric fixtures."

TABLE II—GENERATING APPARATUS AND PARTS, 1919 AND 1914

	1919	1914
Total value	$86,266,114	$17,865,542
Generators (other than small dynamos under 10 kw.):		
Alternating current—		
Steam-turbine driven, under 2,000 kva.:		
Number	532	375
Kilowatts	665,971	600,185
Value	*	$3,895,291
Steam-turbine driven, 2,000 kva. or over:		
Number	144	.....
Kilowatts	1,236,827	†
Value	$8,262,802	.....
Other, including waterwheel-driven:		
Number	3,123	2,137
Kilowatts	821,597	587,820
Value	$4,403,290	$3,542,154
Direct current—		
Steam-turbine driven:		
Number	2,262	264
Kilowatts	408,866	14,916
Value	$2,704,563	$398,379
Other, including waterwheel-driven:		
Number	4,345	9,369
Kilowatts	485,266	206,305
Value	$3,937,080	$2,569,086
Small dynamos (under 10 kw.), starting motors and automotive generators, not including control equipment-value	$36,662,797	$5,933,273
Self-contained lighting outfits (as farm-lighting outfits):		
Number	61,357	.....
Value	$24,078,536	†
Parts and supplies, value	$6,217,046	$1,527,359

* Value included with that of generators of 2,000 kva. or over, to avoid disclosure of individual operations. † No segregation reported in 1914.

TABLE III—TELEGRAPH APPARATUS, 1919, 1914 AND 1909

	1919	1914	1909
Total value	$12,816,341	$2,248,375	$1,957,432
Intelligence (key, sounder, etc.), all kinds	$2,649,365	$201,956	$197,669
Police, fire, district and miscellaneous	2,092,340	1,253,954	1,126,658
Radio and wireless	7,834,698	672,575	448,262
Switchboards, parts and supplies	239,938	119,890	184,843

TABLE IV—TRANSFORMERS AND FEEDER POTENTIAL REGULATORS, 1919, 1914 AND 1909

	1919	1914	1909
Total value	$53,495,570	$28,276,338	$14,630,715
Transformers:			
Number	382,929	115,843	76,729
Kilowatts	14,484,179	2,644,794	1,635,429
Value	$25,560,901	$13,120,065	$8,801,019
Under 50 kw.:			
Number	331,099	110,177	72,776
Value	$10,613,234	$7,316,615	$4,184,832
50 kw. to 500 kw.:			
Number	50,661	4,857	3,953
Value	$9,199,762	$2,625,414	$4,616,187
500 kw. or over:			
Number	1,169	809	
Value	$5,747,905	$3,178,036	
Rheostats, resistances, controllers, motor starters, speed-controlling devices, reactances, regulators, etc.	$23,083,265	$9,788,378	*$2,674,963
Converting apparatus—synchronous condensers, motor-generator sets, double-current generators, dynamotors, frequency changers and rotary phase converters	$4,851,404	$5,367,895	$3,154,733

* Rheostats and resistances only.

TABLE V—BATTERIES, PARTS AND SUPPLIES, 1919, 1914 AND 1909

	1919	1914	1909
Total value	$92,463,195	$23,402,455	$10,612,470
Storage:			
Batteries, value	$56,648,347	$10,615,150	$4,243,984
Weight of plates, pounds	138,438,540	41,079,047	23,119,331
Parts and supplies, value	$3,387,805	$2,465,814	$434,225
Primary:			
Dry—			
Number	79,300,082	71,092,438	33,988,881
Value	$17,805,611	$8,719,164	$4,583,082
Dry, small for flashlights—			
Number	94,483,894		
Value	$7,514,833		
Liquid, including testing—			
Number	2,050,946	306,351	344,650
Value	$3,508,624	$802,525	$729,513
Parts and supplies, value	$3,597,975	$799,802	$621,666

New York fall to third place, but she actually produced less than in 1914.

Lamp production figures are available each year, but still it is interesting to note the tremendous strides that were made in this market in five years. With carbon-lamp production standing almost still, tungsten-lamp production progressed from 74,434,059 lamps in 1914 to 211,383,193 lamps in 1919.

To get an idea of the market for radio supplies one has but to look at the 1919 figures, which were for a period antedating the opening up of the great broadcasting market. From sales in 1914 of $672,575 the market grew in 1919 to $7,834,698.

The household and domestic device market is another that has grown by leaps and bounds. Even where the difference in price is taken into consideration, the 1919 demand will be found to have been many times that in 1914.

The extent of the domestic-appliance market is further shown in the table giving details of motor production. Less than 1 per cent of the 1919 production was of motors rated at over 200 hp. If further analyses were possible, it would probably be found that most of the motors were fractional-horsepower motors.

Another interesting development is the farm-lighting-plant market. The value of this market in 1919 exceeded the value of the total generator market five years earlier.

TABLE VI—MOTORS, PARTS AND SUPPLIES, 1919 AND 1914

	1919	1914
Total value	$116,893,638	$44,176,235
Stationary motors:		
Number	1,533,407	*417,992
Horsepower	3,791,062	*2,882,795
Value	$76,171,558	*$32,286,149
Direct-current—		
Number	380,182	133,492
Horsepower	734,691	980,820
Value	$20,200,313	$13,316,489
Alternating current—		
Under 200 hp.:		
Number	1,151,286	284,500
Horsepower	2,559,526	1,901,975
Value	$52,430,381	$18,969,669
200 hp. or over:		
Number	1,939	
Horsepower	496,845	
Value	$3,540,864	
Marine motors:		
Number	2,630	†
Horsepower	8,428	†
Value	$816,371	†
For vehicles and railways:		
Number	49,256	‡11,880
Horsepower	351,286	‡36,858
Value	$6,355,102	‡$1,351,442
For fans:		
Number	709,350	||
Horsepower	66,915	||
Value	$9,908,001	$4,835,850
For miscellaneous uses:		
Number	198,305	||
Horsepower	141,610	||
Value	$4,920,311	$1,190,564
Parts and supplies	$18,722,295	$4,512,230

* Includes railway motors. † Not reported separately. ‡ Vehicle motors only. || Figures not available.

TABLE VII—INCANDESCENT LAMPS, 1919, 1914 AND 1909

	1919	1914	1909
Total value	$57,646,900	$17,350,385	$15,714,809
Tungsten:			
Number	211,383,193	74,434,059	11,738,619
Value	$46,628,343	$11,886,354	$6,241,133
Carbon filament:			
Number	13,330,273	14,092,055	55,038,378
Value	$1,830,644	$1,397,572	$6,157,066
Decorative and miniature lamps, X-ray bulbs, vacuum tubes, etc.	$5,892,211	$1,702,729	$600,619
Gem and vacuum and vapor lamps	$2,512,435	$2,363,730	$2,715,991
Other types	$783,267		

TABLE VIII—MAGNETO-IGNITION APPARATUS—GENERATORS, SPARK PLUGS AND COILS, 1919, 1914 AND 1909

	1919	1914	1909
United States, total value	$51,286,793	$22,260,847	$6,092,343
Ohio	$11,262,431	$7,472,268	$131,055
New Jersey	7,780,531	2,922,684	469,952
New York	6,000,612	1,205,494	1,483,735
Pennsylvania	3,509,392	538,762	*
Indiana	2,404,530	2,950,792	2,223,221
Illinois	1,842,045	413,986	253,451
Wisconsin	1,330,480	202,130	63,606
Minnesota	56,678	.....	.....
All other states	17,100,094	6,554,731	1,467,323

* Included in "All other states."

TABLE IX—HOUSEHOLD AND INDUSTRIAL APPARATUS AND DEVICES, 1919, 1914 AND 1909

	1919	1914	1909
Total value	$54,793,195	$4,048,915	$1,954,112
Welding apparatus (not including motor-generator sets)	2,701,378	231,082	83,505
Electric furnaces (for iron and steel and brass industries)	1,040,337	*	*
Heaters (industrial heaters; air heaters, including those for cars; water heaters)	2,889,734	352,617	919,533
Stoves and ranges	3,444,170	671,413	
Miscellaneous cooking devices (griddles, grills, toasters, percolators, etc.)	7,815,212	1,327,183	951,074
Flatirons	5,646,421	1,466,620	
Vacuum cleaners, vibrators, clippers, cutters, etc.	21,842,439	*	*
Other portable motor-driven devices (motor built in)	6,985,809	*	*
Other stationary motor-driven apparatus (motor built in)	2,427,695	*	*

* Not reported separately.

TABLE X—ELECTRIC MEASURING INSTRUMENTS, 1919, 1914 AND 1909

	1919	1914	1909
Total value	$19,322,164	$8,786,506	$7,800,010
Station meters and apparatus	$7,084,983	$1,585,500	$1,639,202
Testing and scientific instruments	3,336,172	1,073,060	546,970
Meters for consumers' circuits	8,901,009	6,127,946	5,613,838

TABLE XI—SWITCHBOARDS, PANELBOARDS AND CUT-OUT CABINETS FOR LIGHT AND POWER, 1919, 1914 AND 1909

	1919	1914	1909
United States, total value	$17,735,780	$8,989,111	$5,971,804
New York	$7,483,106	$5,505,685	$2,789,297
Pennsylvania	5,197,725	1,566,433	1,243,356
Ohio	772,683	237,916	236,930
Illinois	444,605	419,931	448,185
Massachusetts	375,699	157,961	304,502
Connecticut	356,104	224,481	151,385
Wisconsin	317,097	*	†
Indiana	248,784	229,989	117,877
California	183,541	130,162	90,594
Washington	169,928	*	†
Minnesota	158,454	71,971	48,385
All other states	2,028,054	444,582	541,293

* Included in "All other states." † Figures not available.

TABLE XII—INSULATED WIRE AND CABLES, 1919, 1914, AND 1909

	1919	1914	1909
United States, total value	$84,216,921	$69,505,573	$51,624,737
Wire	$53,302,821	*	*
Cables	30,914,100	*	*
Illinois	$18,660,109	$9,626,775	$9,487,006
New Jersey	16,715,538	15,038,971	13,945,425
New York	14,257,277	19,178,327	9,485,282
Connecticut	11,456,468	6,206,803	4,205,509
Rhode Island	6,006,526	6,045,876	7,741,411
Massachusetts	5,832,663	6,799,411	2,194,474
Pennsylvania	5,367,492	3,299,485	2,796,825
Michigan	3,160,516	†	†
All other states	2,760,332	3,309,925	1,768,805

* Not reported separately. † Included in "All other states."

How to Put on a Stock Campaign

Preliminary Steps Necessary in Laying Out Campaign—Unexpected Obstacles to Be Met—Advertising and Follow-Up Methods—Keeping Employee Interest Aroused

By PERCY H. WHITING
Manager Securities Department, Central Maine Power Company

THIS article has been written for the man who believes in the sale of utility securities to customers and wants to know in intimate detail how to go about it. It is straight-from-the-shoulder advice on the organizing of a stock campaign. It analyzes carefully the necessary steps which must be taken to carry out such a program. It warns against possible pitfalls. It draws largely upon the author's personal experience in customer-ownership campaigns, and his deductions are based upon first-hand information. It concerns itself chiefly with methods which can readily be employed for a selling campaign in territory where stock has never been sold before. Mr. Whiting has agreed to write two more articles to follow, one to deal with the problems to be met in carrying on a campaign after the cream has been skimmed off, and the other with the development of a permanent securities department manned by salesmen who give their time exclusively to stock selling.

FOUR years ago the writer of this article was dropped unceremoniously beside a bale of stock certificates—the first he had ever seen—with brief but explicit orders, "Sell 'em!" He did—and it was an experience calculated to teach any one a great deal in a comparatively short space of time. What was learned in that hectic four years of stock selling will now be set down for the benefit of those who wish to sell their securities to customers through their employees by a series of selling campaigns.

The selling of stock to customers is an easy matter after you have, first, made your customers want the stock and, second, made your employees believe they can sell it.

You accomplish the first step—"making them want it"—by two processes, first, setting limits on the amount of stock you will sell and the people to whom you will sell it, and, second, advertising the stock.

The gentle art of making an article desirable by limiting the amount that will be sold was discovered hundreds of years ago. "We have only fifty of these beautiful coats at $25" is enough to start a riot in a department store, while the familiar "Only one to a customer" has stimulated sales since advertising started. One of the first power companies that used this device of selling a limited number of shares in a customer-ownership campaign was, I believe, the Narragansett Electric Lighting Company. It offered a "limited number of shares of its stock, not over five shares to a customer," and sold its issue in a few hours. Others have tried it with success.

So now most of us stimulate the demand for our securities, when we can, by limiting the sale ordinarily (a) to so many shares in all, (b) to customers and employees only, and (c) to not over ten shares to a customer. Combine these limits with the advertising which will be discussed later, and assuming that the local standing of your company is even "fair" and the price not too far out of line, your preferred stock will be attractive to your customers.

Surprisingly enough, it is generally more difficult to convince your employees that they can sell than it is to make your customers want to buy. The attitude of the average employee is: "I'm a [for instance] lineman, what do I know about stock selling?" To meet this situation I have used successfully what I call the "ten-point" plan. I admit to employees that they cannot sell. But I get them to admit that they can write, read and walk. After they admit that much they must admit further that they "can call on ten customers in ten days and tell them ten points about the stock." If they will do this simple task, they will get the orders. The rest of employee stock selling is a matter of detail.

The necessary details, carefully explained, are given at some length in a "Standard of Practice" which the writer has prepared for the National Electric Light Association and which will soon be ready for the use of member companies. A brief summary of the steps of a sale follow:

The preliminary step is the same as for rabbit stew: "First catch the hare." The precaution of being sure you have stock to sell before starting to sell it is fervently advised by a man who once carefully arranged the set-up of a campaign and then watched it slowly disintegrate while a public utility commission pondered interminably over the simple question of an inevitable issue. So be sure your stockholders, directors and public service commission have passed on the stock; that if necessary, it has been offered to stockholders, and that you have the stock on hand to sell. I know one man who started a campaign with fewer than fifty certificates on hand—with resulting complications.

POSSIBLE STUMBLING BLOCKS

Now for a few important points:

Warning No. 1. Don't try to sell too much stock in any one campaign. It is not easy to say just how much "too much" is. Some companies set their quota at a share per month per employee. This is about right for the first few sales, but the writer doubts if that selling pace can be kept up over a period of years. Experience indicates that in an opening campaign (it comes harder the longer you do it) for every ten customers the company has you can sell approximately one share of stock, or, figuring it another way, each employee will sell on an average six shares in one campaign.

Take the advice of one who has known grief: If you have 25,000 customers, keep your quota down to

Publicity Used in Central Maine Power Company's Stock Campaign

LOOKS EASY MONEY FOR ONE C. A. RUNNALS IN THIS CONTEST

But Miss Mildred A. Cook Is Playing A Strong Second and May Give Him A Long Run; Mrs. M. P. Rideout Is Third—Foxcroft

The Dividend Pays the Bills—

THE 61st DIVIDEND of Central Maine Power Company 7% Preferred Stock went out on the first day of the new year to the Company's more than 7,000 stockholders.

For more than 18 years these dividends have been going out with unfailing regularity -- at first semi-annually, now and for many years, quarterly.

The present sound financial position of the Company gives all assurance that these dividends should continue with the same regularity as far into the future as the mind of man can be projected.

Many stockholders have bought just enough stock to pay their light bills. Others have bought vastly more,--enough to pay all their bills. For small investors or for large, for customers and for every other resident of the State of Maine, no security compares, we feel sure, in its multitude of advantages with Central Maine Power Company 7% Preferred Stock.

The Price is $107.50 a share, the yield is 6⅞% net

Maine Power Co.
Augusta, Maine
FOSTER, 112 Fidelity Bldg.
Dist. Securities Dept. Augusta, Maine.

P-O-W-E-R
Is Behind All Industry

Because no industry can operate without power and because hydro-electric power is the cheapest and most satisfactory of all powers, hydro-electric companies should always prosper.

Records show that, beyond almost any other class of companies, power companies do prosper and do pay their dividends.

One of the great New England power companies is Central Maine Power Company. Year in, year out, it develops an average of 95% of the power it sells from water. It can always find a market right at home for all it develops.

Is it any wonder that the preferred stock of this company is one of the safest and best of investments. The price is $107.50 a share, the yield 6% net.

Central Maine Power Co.

E. T. Foster, Room 112 Fidelity Building, Portland District Manager. Securities Dept. Augusta, Maine.

INVEST IN A BASIC INDUSTRY

Part of it belongs to me

Why not own part of Central Maine Power Company—why not become a profit-sharing partner in 18 hydro-electric plants, 4 steam plants and hundreds of miles of transmission line—in buildings, sub-stations and the substantial equipment of a great home power company?

And why not share in the fair earnings of Maine power?

You can do this by buying Central Maine Power Company preferred stock.

The money thus raised will be invested in power developments and line extensions—in building Maine and in bringing to the Pine Tree State both population and prosperity.

Buy into a substantial company by ordering your stock today.

Central Maine Power Co.
E. T. Foster, 112 Fidelity Bldg. Portland District Manager.
Securities Dept.
AUGUSTA, MAINE
YIELD 6½% NET.

Why Don't You Pick Up GOOD MONEY DRIFTING BY YOU EVERY DAY

When we let Maine water power run unharnessed to the sea we let money drift by us—never to return.

Industries will come to Maine, bringing population and pay-rolls, just about as fast as we can develop the power they need.

To develop this power and to you the investment money to do it with, we must put some of the money at work, developing Maine power money to do it with, we must put some of the money at work, developing Maine power money, by no means a small amount. Yet going ahead, and getting it, are plenty of drifting to the sea.

More than 7,000 Maine people have invested in Maine water power by buying Central Maine Power Company 7% Preferred Stock. Price $107.50 a share. Yield 6½% net.

Central Maine Power Company
E. T. Foster, 112 Fidelity Building, Portland District Manager, Securities Department.
Augusta, Maine

Invest for Safety— and to Build Maine

The water powers of Maine hold out great industrial possibilities---WHEN THEY ARE DEVELOPED. Central Maine Power Company has felt, because Maine is handicapped by its location and by transportation difficulties, that the fundamentally important thing is to develop powers NOW and have them ready for use. This, the Company has done and hopes, as the need arises, to continue doing.

At Skowhegan a new dam and a new power house have just been completed with three 4,000 horse power units installed. Two more units can be added there, as needed. At Deer Rips on the Androscoggin River, a new unit has been added to the power station there, which gives this plant a total development of 9,000 horse power. All told, the Company now has available approximately 40,000 horse power of water power and 10,000 horse power of steam reserve.

THE advertising matter shown here is typical of the publicity which proved its value and brought tangible results in stock sales. In the upper left-hand corner is a cartoon which appeared in the company's house organ, the "Exciter," during an employees' contest. At the bottom are shown the cover and two pages of an interesting booklet telling of the company's property that was given to prospective stockholders. Four newspaper advertisements are also reproduced.

2,000 shares, or a little below. You might sell 3,000 easily, but you would be more likely to wreck your campaign, saturate your market and discourage your employees. These figures apply to employee selling. If you use regular salesmen, you can sell more. A moderate campaign can be repeated at six-month intervals for several years, although with growing difficulty as time passes and the cream is skimmed off.

Warning No. 2. Arrange for the prompt issuing of the stock. Have it signed in advance so that, from the home office at least, it can be delivered over the counter with no more formality than accompanies the selling of a vacuum cleaner.

Your next move will be to arrange the terms of sale. Decide the price at which you are going to sell the stock for cash, then add $2 to arrive at the divided payment price. Decide also on the commission you will pay employees for selling the stock. This commission varies from 25 cents to $3 per share.

Warning No. 3. Do not pay too high commissions. It tends to cause employees to neglect regular work in favor of stock selling. From $1 to $2 per share is about right.

Warning No. 4. Decide what you will do to protect your stockholders who wish to resell their stock. The standard resale proposition is: "The company will at any time attempt to resell your stock at the prevailing price and will charge you $2 per share for this resale service."

Advertising Preparations

Next, have your order blanks, receipts and all necessary forms printed. Have them uniform in size, simple, untechnical in language, and well printed on good stock. Don't let your legal or treasury department write them. Your order or subscription blank need say little more than "Please enter my order for ..... shares of stock." Your receipt form can be equally simple. Remember that you are dealing with your customers, with people unused to making investments, with people who abhor legal documents, with people whom you will never sue, even if they do not live up to their agreement to buy.

With your order blanks in the printer's hands you are ready to figure on your advertising. Your first job will be a letter to your customers. Write a human, informal sort of document. Tell your customers why you are offering stock, why customer ownership helps both company and customers, why the stock is a good investment. Bear down heavily on the limits you have placed on the sale: "Only so many shares to sell, to be sold to employees and customers only, and not more than ten shares to any one customer."

Then write a series of advertisements to run, before the sale begins, in the newspapers of your territory. The writer believes that these advertisements should say nothing about the stock but should tell the story of the company, when and why it was organized, how it has grown, the physical property it owns, its willingness and ability to give service—points likely to build up the feeling that your company is a good company. In the closing advertisements, by way of working up interest in the letter to customers, I generally say, in effect: "We shall soon write our customers a letter about our plan of mutualizing the company, which we believe they will find of interest." If they read that advertisement, they will read the letter.

You will need also cards to go in all windows reading after this formula: "Central Maine Power Company 7 per cent preferred stock for sale here." If your window-display man has any ingenuity, he can readily get up attractive windows.

If you serve a city of less than 200,000, you are now due to "sell" your proposition to every bank in your territory. Why?

Because banks in towns and smaller cities are constantly advising their depositors about investments and can make endless troubles unless you convince them that customer ownership is a good thing not only for the company but also for the community. Get the banks to admit (1) that the city can grow no faster than its power company and (2) that the stock is a good investment; then (3) get them to say what they will allow on the stock as collateral. Ordinarily this is 70 per cent to 80 per cent in Eastern states.

Employee Meetings

The advertising campaign just discussed will sell your plan to your customers. Your next move is to prepare for the employee meetings that are to sell the proposition to your employees. You will need a little book on stock selling to explain matters to them. Such a book is being prepared by Fred H. Scheel for the N. E. L. A. and will soon be available for members. Get one for every employee. If you publish an employee house organ, use that also to tell the story to employees.

Next, get up the "ten points" that you are going to ask your employees to repeat to the ten people on whom they will call. They are easily prepared. Just list the strongest points in favor of the stock and the company, select the best ten, boil them down and have them printed or mimeographed. Touch on points like "safety of investment," "freedom from care," "customer ownership." You will find samples in the coming N. E. L. A. "Standard of Practice for Stock Selling."

Your next task is to prepare the talk that you will make at the employee meetings. This talk should touch on customer ownership; it should dwell on the fact that employees will not be asked to *sell* stock; it should tell what employees will be paid if they do happen to sell, and it should explain how to fill out order blanks and receipts for payments. The most important part of the talk is to get every person present to pledge himself to call on ten people within ten days and give them the "ten points" about the company's stock.

Explain in your talk the kind of people you want your employees to call on, not the rich men and the professional investors, but the good, solid, substantial middle-class people, preferably those with money in the savings banks. Explain why the people will buy the stock without the need for long argument—that the newspaper advertising and the letter and the good standing of the company have combined to "sell" customers, and that about all the employees have to do is to call on the people and gather in the orders.

The rest of the talk will occur to you, but be very sure that you emphasize strongly the most important point that you don't expect employees to sell—that you only ask them to call. And be very sure also that you pledge them to make the calls. The big reason for this pledge to make calls is that no superintendent can put pressure on employees to "sell stock," since that is not their business. But after employees have agreed to call on ten people and tell them ten points, then a superintendent or department head can justly put pressure on to get them to do what they have agreed.

With all these preliminaries arranged, start your

advertising, send out your letters to customers and hold your employee meetings. Much depends on your sales meetings. They should last not over an hour.

The first man to talk should be some high company executive. To have him there shows that the big men of the company stand behind the stock selling. He should not say much but should make one point very clear, and that is that he personally believes that the stock which is being sold is a good, safe investment. Then should follow the talk by the man in charge of the sale. What he is to say has already been indicated.

At the close of his talk it is a good idea to put on a demonstration sale. Have some employee sell stock to some other employee. The salesman ordinarily comes in, introduces himself, "opens," goes through the "ten points," answers questions and "closes." It is a good plan to rehearse this demonstration sale carefully in advance, because it ought to run off smoothly in order to impress employees with the fact that a sale is really a simple matter.

The next step is to offer employees a chance to subscribe to the issue. This is something else that can be worked up in advance. Have your department heads circulate around in advance of the meeting and let employees know that they are going to have this chance to buy stock. If you can work one district against another, you can accomplish wonders. I have seen almost a whole room full of people rise when we asked those who were going to buy stock to stand up.

Then close your meeting with a talk by the local district manager or department head. The point he must make is this: "You have all agreed to see ten people and tell them the ten points. I am going to see that you do it."

After that, if your set-up has been well fabricated, you can go away on a vacation. You will, however, leave a few jobs for somebody to do.

Maintaining Employees' Interest

Daily sales meetings are helpful. They should be informal affairs which occupy perhaps the last twenty minutes before the whistle blows in the afternoon—just to discuss sales, sales plans and to supply enthusiasm. Daily bulletins are a necessity. Get them out in newspaper style on your mimeograph. They should contain the news of the sale, number of shares sold, number still unsold, number sold by individuals and by districts. Tell briefly of any interesting sales made, of any interesting happenings. Make each superintendent and each department head report daily on the number of calls made by each employee. Here is where you can put your pressure on executives. They can't require employees to sell, but they can require them to make the calls they have agreed to make.

If you have a few executives or salesmen who can be used as field managers, put them at the disposal of your employees. They can help out on difficult sales and act as "closers" for inexperienced but willing salesmen. When employees report on their ten "prospects" give them new lists selected by somebody who knows the territory. The secret of success is to keep calling.

A campaign rightly run ought not to slow down, but then, sometimes it will. If it does, have a few reserves you can call on.

The best resource is additional newspaper advertising. You can set forth the merits of the stock in brief, vigorous advertising which will help your employees to make sales. Special prizes are helpful. Some possibilities are a prize for a sale by those who have not previously made one, a prize for the most sales, for the most ten-share sales, for the most divided-payment sales, etc. One good form of stimulation is to pick out your best salesmen, form them into teams and offer a prize for the winning team. If conditions continue bad, it may be desirable to send out a folder or circular to a new list of prospective buyers.

As a last resort it might pay to hire a few men as stock salesmen, but do not get regular security salesmen as they are never fitted for this work. The best men for the job are insurance salesmen, correspondence-course salesmen and the like—people used to selling a service. These measures should never be needed in a preliminary sale. If executives will get the calls made, the sales will take care of themselves.

Last Minute Sales

The final step is to arrange for "over-the-top day." When you have two or three days' supply of stock left, arrange to sell it in one last whirlwind drive. Pass the word around that only so many shares remain for sale and notify everybody to close in on all "prospects." Tell them to call on or telephone every likely purchaser: "Only so many shares left—buy today or it will be too late." Call on every department head and district manager and urge on him the necessity of getting every man to make his calls. Keep in touch with every district and department by wire, and when the stock is about gone set a definite time when the issue is to close, as nine o'clock Monday morning.

When only a few hours remain put some good talkers at work on the telephone. Give them sections of the customer list and have them call up customers at random and tell them that unless they buy by such a time it will be too late. It is wonderful how many sales can be closed by this method. In a sale in Connecticut I saw an employee continue making calls until nearly midnight. At least two people who were dragged out of bed agreed to come around the next morning and buy stock—which they did.

Any public service company which will follow this plan will without doubt sell stock successfully. For this plan has worked through eleven campaigns in three different Eastern states and should, with reasonable modifications, be good for a "first" sale anywhere.

The means that have to be employed when the cream has been skimmed off and your selling hits the long down slant of "diminishing returns" is another story, as is also the method of selling through regular security salesmen. Any manager, however, can be sure of this much: The first few sales campaigns are easy and can be successfully accomplished by almost any wide-awake company. Such sales produce money at a low cost and, through customer ownership, build good will and provide immunity from unjust political attack.

Entire Electrical Bay of El Paso Station Built Outdoors

SEVERAL views of the outdoor electrical bay of the El Paso (Tex.) Electric Company's recent plant extension, emphasizing certain improvements in layout, were featured on page 670 of the April 8 issue of the ELECTRICAL WORLD. It may be of interest to readers to know that the designers and builders of the plant and extension were Stone & Webster, Inc., Boston, Mass.

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Cost of Outdoor Metering Equipment

To the Editors of the ELECTRICAL WORLD:

With the increase in the use of outdoor metering equipment that is now being experienced a closer scrutiny of the cost of such apparatus should be made. In general the apparatus used for this purpose is satisfactory in design, but the cost is very high. In the case of many companies it has been necessary to reduce the installation cost by using indoor-type apparatus protected from the weather by wooden boxes or houses. This is not entirely satisfactory. Particularly is it undesirable to build on a pole a house sufficiently large to inclose the equipment necessary for metering at 11,000 volts or higher.

H. R. WAKEMAN,
Superintendent of Distribution.
Portland Railway, Light & Power Company,
Portland, Ore.

Delayed-Time Low-Voltage Release Is Required

To the Editors of the ELECTRICAL WORLD:

Thus far we have seen no delayed-time low-voltage release for application to the control apparatus of industrial motors which meets the requirements of reliability, accuracy and cost essential in such a device. The lack of a device of this character presents a rather serious problem to many consumers and to the electric companies which serve them. In general the low-voltage releases are practically instantaneous in operation. No leeway in time is allowed to take care of the cases in which a short circuit occurs followed by a momentary dip in the voltage. Such short circuits cannot be prevented on extensive transmission and distribution systems, although their duration is being steadily decreased through the application of more elaborate systems of protective relays and automatic switches. If these short circuits cause the operation of many low-voltage releases, it may in many cases be useless to try further to decrease the extent of interruption. But if the low-voltage releases were designed to be delayed in operation for a period of but a few seconds, the further installation of expensive protective equipment could be justified.

One example of the need of such a device may be given. In California there are thousands of small pumping plants used for irrigation. These are often in a remote part of the ranch, and their continuous operation during the pumping periods must be made most reliable. If a short circuit occurs, either on a distant transmission line or a nearby distribution line, the low-voltage release operates and the pump stops. The farmer must then go to the motor to start it again. Needless to say, he is irritated, especially if the trouble occurs in the middle of the night.

A satisfactory delayed-time low-voltage release must be rugged, foolproof, dust-proof, moist-proof, cheap and reliable. It is a small thing, but one of the greatest importance.

G. E. A.
San Francisco, Cal.

Against Government Interference

To the Editors of the ELECTRICAL WORLD:

I have read with interest your recent editorial setting forth your views of the coal-mining problem. The ideas of a central-station man closely allied with the coal industry should certainly be worthy of comparison with your own. I operate a mine-mouth power plant serving fifty-five non-union mines. The miners and operators are my neighbors, and I am in close touch with all conditions in the field.

To begin with, the price of coal to the consumer at the mine tipple is no longer a matter of much concern, as competition has reduced this price to a point where none but the best-equipped mines can market their coal. In this field there are any number of coal operators who will sell today good steam coal suitable for stokers for $1.35 to $1.50 per ton at the mines. No union-operated mine can at present produce and sell coal with any margin of profit at these figures. The result has been that the union mines have run very intermittently in the past year, while the non-union mines have operated almost continuously. Consequently the non-union miners, who have taken wage cuts, have profited by this steady production. Many of them made over $5,000 and few under $2,000 last year in this field, while the average wage of union miners in 1921, as stated by Ellis Searles, editor *United Mine Workers' Journal*, was from $700 to $937.50 in various districts.

The whole question will finally solve itself if left alone. Those mines that can produce cheap coal and those miners who are more interested in what they have at the end of the year than in the amount they receive for mining a ton of coal will survive. During and immediately after the war the poorest unequipped mines with high production costs set the price, but now the best-equipped mines are setting the price. Those mine operators who cannot follow have already shut down or will soon be forced out of the running, and those mine workers who still insist on war prices for their labor will be forced, by natural laws of competition, to follow suit. Government interference, with its consequent demoralization, can only raise the price to the consumer.

W. F. FICKLEN, District Manager.
Kentucky & West Virginia Power Company, Inc.,
Hazard, Ky.

German Electrical Exports

To the Editors of the ELECTRICAL WORLD:

May I draw your attention to the fact that the report you print on page 306 of your Feb. 11 issue from the United States Department of Commerce is not exact? The exportation of electrical goods from Germany is not increasing but decreasing. The amount in marks cannot be taken as a base of comparison as the mark has constantly decreased in value during the last three years. A comparison can be had only by comparing the quantity of electrical goods exported, not the price. An article appearing in the *Elektrotechnische Zeitschrift* (1922, No. 3) gives the value of the exports in gold marks, this being to a certain extent a fair index of their amount. The article shows a steady decrease.

Berlin, Germany. AXEL SCHMIDT.

Electrolysis Research Under Way in the South

To the Editors of the ELECTRICAL WORLD:

The following abstract of a letter which has been sent to members of the research sub-committee on electrolysis may possibly be of interest to readers of the ELECTRICAL WORLD:

With the completion and distribution of the 1921 report of the American Committee on Electrolysis, together with the attention directed to it by the technical press, considerable interest in the subject of electrolysis has been aroused, resulting in a renewed demand for the solution of some of the outstanding questions pointed out in that report which, through lack of fundamental data, remain unsettled.

Perhaps the chief value of the 1921 report is to direct attention to the urgent necessity of acquiring additional information of a fundamental nature before the general engineering solution of the electrolysis problem can be obtained, and to stimulate the activity necessary to procure this information. Chapter 5 of the 1921 report, entitled "Electrolysis Research—Further Work Necessary to Arrive at an Engineering Solution of the Problem," points out the nature of the information needed. The purpose of this memorandum is to direct attention to the plans, so far as they have been developed, for procuring some of that information.

The 1921 report points out that the question of measures for preventing injury by electrolysis from stray railway currents comes up as an engineering problem after, and not until after, the railway system has been placed in proper economic condition from its own standpoint. Furthermore, means applied to the railway for the purpose of placing it in economic condition cannot logically be viewed as measures of electrolysis mitigation, despite the fact that fortunately many of the same measures which tend to economy of railway operation also tend to reduce stray currents.

This conception of the problem has led the research sub-committee to request the aid of the American Electric Railway Association in conducting a study of the railway power distribution problem, to determine, among other things, the economic limits of track voltage drop. You may be gratified to know that the association has acceded to this request, and it is understood that it will appoint a committee to confer with the research sub-committee in the near future.

The determination of the economic limits of track voltage drop is, of course, primarily a problem in railway engineering; but this committee is concerned in it because its solution is necessary to the general engineering solution of the electrolysis problem. When the railways are placed in the condition of maximum economy from their own standpoint, the result will be that a large part of the problem arising from stray currents will have disappeared. It is, however, our duty to determine (1) what the effect of the remaining stray currents will be and, if found to be a source of substantial injury or hazard to underground structures, (2) how this effect can best be overcome.

Since we require quantitative information in order to answer both of the above questions, it has been recognized that suitable measuring devices are necessary, and that, if possible, these devices should be capable of measuring that to which damage by electrolysis is directly attributable—namely, current from the surface of the structure to earth.

The Bureau of Standards, as you know, undertook the development of apparatus to accomplish this purpose, and it has succeeded in such degree that we believe the mean value of current at any given point, as at the surface of an underground structure, can now be determined with reasonable facility and precision by means of the earth current meter. It takes but limited observation, however, to realize that current does not leave the surface of an underground structure with even approximate uniformity of distribution, and it is of the greatest importance to determine a factor which will suitably allow for the non-uniformity with which current leaves the surface of a structure in practice. Direct experimental determination of this factor offers considerable difficulty, but a suggestion has been made looking to a statistical method of attack, and an investigation of this proposal is under way at the present time.

Prior to the determination of this factor, however, the earth-current meter can still advantageously be used for our purposes, as at present it enables us to determine (1) the mean current density at any point at the surface of an underground structure, (2) the true polarity of that structure to earth at that point, and (3) the resistivity of the earth at any point in the region surrounding the structure. We should not fail to note that all of these quantities are of the greatest importance as factors in the solution of our problem, and that we have previously had no field apparatus that would enable us to determine them. It is felt for these reasons that the apparatus provides us with a powerful instrument for research.

In connection with formulating a program of field work, E. R. Shepard of the Bureau of Standards and Elam Miller of the research sub-committee went South on Jan. 5 and visited Atlanta, Savannah, Jacksonville, Mobile, New Orleans and Birmingham. They interviewed railway, gas, water and telephone officials in these Southern cities for the purpose of determining in which of them the conditions were best suited for the field investigations which it had been determined to hold during the winter, and in which of them and to what extent the support of the local interests could be obtained for these investigations. Their reports showed that we might count upon the enthusiastic support, to any reasonable extent, of the local utilities in all of the cities named.

We found that Atlanta and New Orleans were best suited for our purposes, and on Feb. 6 two of the Bureau of Standards engineers were sent to conduct simultaneous investigations in these cities, A. J. Fecht being assigned to Atlanta and E. R. Shepard to New Orleans. A tentative program for the tests was drawn up.

H. S. WARREN,
Chairman Research Sub-committee.
American Committee on Electrolysis.
New York.

Thirty-Year-Old Transformers Still in Service

To the Editors of the ELECTRICAL WORLD:

We observed with interest the note and illustration regarding our early transformers in your issue of March 4, 1922. However, we should like to point out that the rating of these units was 110 kw., not 10 kw., as mentioned in the article.

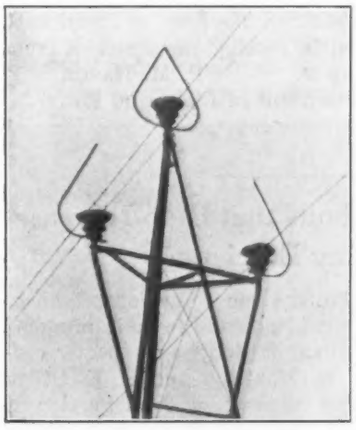
V. Z. DE FERRANTI,
Manager Transformer Department.
Ferranti Limited,
Hollinwood, Lancashire, England.

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Lightning Protection on 44,000-Volt Transmission Line

PROTECTION against severe lightning has been given to the 44,000-volt transmission line of the Ray (Ariz.) Consolidated Copper Company by horns surrounding the pin-type insulators. In addition to the horns, a portion of the line is protected by an overhead ground wire supported on a bracket attached to the tower between the cross-arm and the top insulator. The horns are about 2 ft. in height and are fastened to the cross-arm at the base of the insulator and extend to a point directly above the wire as shown in the illustration. They are not intended to prevent static charges gathering on the line, but to provide a path for the arc of short circuits away from the insulator. It has been found that during the seven years of operation with these horns their presence has prevented many cases of insulator breakage. Generally after short circuits service may immediately be resumed. The line is about 17 miles long and extends between Ray and Hayden, Ariz. In this region lightning occurs nearly every summer afternoon.



HORN GAP USED TO BREAK FLASH-OVER ARC ON 44,000-VOLT TRANSMISSION

FIELD EDITOR ELECTRICAL WORLD.

San Francisco, Cal.

Insuring an Exact Brush Fit

IN FITTING brushes for any test where brush contact has an appreciable influence considerable difficulty is encountered in insuring an exact fit. Sandpaper pulled under the brushes will form a curvature on the end of the brush, but when machine is started the brush seldom bears all over its entire surface. If a piece of "commutator stone" is then applied to the commutator while it is in motion, the grinding process thereby produced will cause the stone dust to be carried under the brushes and will make a polished and practically perfect fit of the brushes, such as would be obtained after a week's normal operation.

Care should be exercised in applying the stone to have the rotation "away" from the hand and body, because when the stone begins to "bite" after the glaze is removed from the commutator surface there is a very decided pull as the stone takes hold and grinds and the hand may be drawn under brush stud and severely injured. It is better to have the stone mounted on a piece of wood as a handle. Coarse sandpaper applied before the stone will remove the oil and glaze from the commutator surface. After the stone begins to cut only a few seconds is required to fit the brushes, which have, of course, been previously sandpapered in the usual manner.

EDWARD A. GIBBS.

Boston, Mass.

Adjustment of Turbine Governors

THE satisfactory operation of governors of the "Junggren" inertia type driven direct from the end of vertical turbines depends on securing a proper adjustment between the springs and the weights and reducing the amount of friction between moving parts to a minimum. Springs are adjusted by a threaded sleeve attached to the tops of the spring plug, while weights are adjustable by the insertion of screw plugs. Any excess friction will cause a lag in the regulation.

These governors are fitted with an auxiliary spring actuated by a motor for the purpose of varying the speed while synchronizing. Excessive wear is liable to occur on the balls and raceways if this auxiliary spring is used to regulate the load between units. Its primary purpose is to provide a simple means of synchronizing the unit, and it should be left in mid-position in order to give the best regulation and the minimum load on the transmission bearing, balls and raceways, and also to prevent throwing the main spring out of balance.

If it is desired to change the speed permanently from that at which the governor is set to operate, it should be done with the nut at the top of the governor. This change is only possible, without seriously affecting the regulation, for a very small range either side of the speed for which the spring is designed.

If a governor which has been in operation for a considerable time does not maintain uniform speed, it means that the spring is unable to carry the load imposed upon it. Therefore it is necessary to remove weight from the governor weight. By so doing the load imposed upon the spring is decreased and it will be able to maintain its speed. This change, however, broadens the regulation. If it is necessary to maintain the same regulation as the governor had before the weights were removed, it will be necessary to unscrew the plug from the spring a slight amount in order to bring more coils into action. Sometimes there may be some difficulty in doing this on account of lack of space in the governor. However, by the manipulation of these two methods any desired regulation can be obtained, together with the decrease of load upon the main spring. Particular care should be given to changing the plugs in the spring, and some difficulties may be met in getting the springs to revolve true after disturbing the position of the plugs due to inequalities of the coils in the spring.

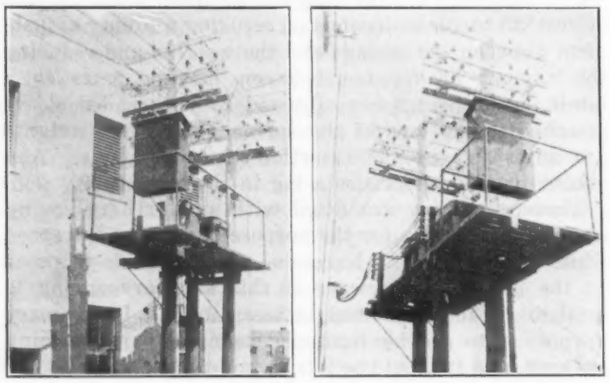
If the governor is too sensitive—that is, gives too close regulation—it is generally shown by the weights being constantly in motion, thereby wearing the knife edges to a greater extent than necessary. The only change necessary in such a case is to remove weight from the governor weights and slacken the spring tension.

In case of broader regulation being desired it can be obtained by screwing the plugs into the spring, thereby reducing the active number of coils. This is quite effective, but the load upon the spring is increased thereby.

Boston, Mass. FIELD EDITOR ELECTRICAL WORLD.

Standardized Transformer Installations Cost $125

SIMPLICITY and stability are the features of a standardized outdoor transformer and metering scheme adopted by the El Paso (Tex.) Electric Railway Company. These installations are generally made to serve loads in excess of 50 hp. and are usually supplied at 220 volts. The cost of the pole structure to carry the transformers and necessary metering equipment

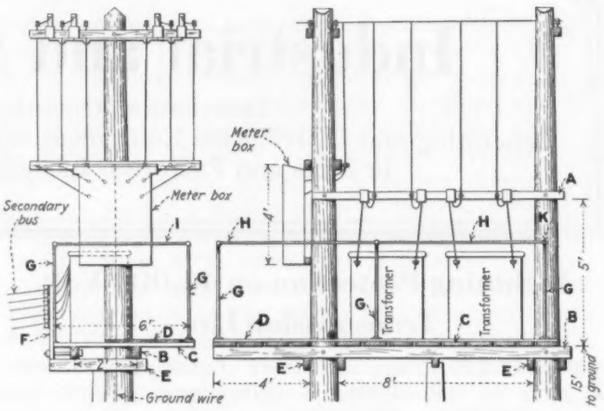


METERS ARE PLACED IN A WOODEN BOX MOUNTED ON ONE OF THE POLES

was approximately $125 at prices prevailing during May, 1921, exclusive of the transformers and meters. Meter readers are entirely protected from the 2,300-volt primary current, and a sufficient working space is allowed on all sides of the equipment to facilitate inspection and maintenance. The material necessary for the

BILL OF MATERIAL FOR STANDARDIZED TRANSFORMER INSTALLATIONS

Index	No. Required	Material
..	2	35-ft. poles
..	1	20-ft. stub
..	5	Standard cross-arms, bolts and braces
..	4	2,200-volt lightning arresters
..	26	2,200-volt insulators
..	4	100-amp., 2,200-volt cut-outs
..	2	Five-point brackets
..	1	Standard meter box No. 1
A	1	4-in. x 4-in. x 10-ft. 6-in. lumber
B	2	4-in. x 6-in. x 15-ft. lumber
C	10	2-in. x 12-in. x 6-ft. lumber
D	2	1-in. x 12-in. x 13-ft. 6-in. lumber
E	5	4-in. x 6-in. x 4-ft. lumber
F	2	2-in. x 4-ft. x 3-ft. 6-in. lumber
G	5	1½-in. x 4-ft. iron pipe
H	2	1½-in. x 6-ft. iron pipe
I	1	1½-in. x 4-ft. 6-in. iron pipe
J	1	1½-in. x 5-ft. 6-in. iron pipe
K	1	1½-in. x 2-ft. 9-in. iron pipe
..	6	1½-in. floor flanges
..	1	1½-in. pipe T
..	4	Three-way pipe fittings
..	2	20-in. x ¾-in. bolts
..	2	22-in. x ¾-in. bolts
..	2	12-in. x ¾-in. bolts
..	2	14-in. x ¾-in. bolts



NEATNESS AND SIMPLICITY MARK THIS STANDARDIZED INSTALLATION

construction of this installation has been so listed that the least time is required in getting the material from the stores and assembling it. P. M. HATCH,

Superintendent of Light and Power.

El Paso Electric Railway Company,

El Paso, Tex.

Boiler-Room Methods that Help Increase Operating Efficiency

THE steps that the boiler-room force must take to meet changing load conditions and to maintain good efficiency in a modern central station were recently presented in a paper by I. E. Moultrop and R. E. Dillon before a combined meeting of the New York Section of the American Institute of Electrical Engineers and the Metropolitan Section of the American Society of Mechanical Engineers.

It was pointed out that the boiler-room foreman is responsible for having a sufficient number of boilers lighted to take care of the daily peak and to have the proper number steaming to give the best efficiency at all times. With this information, which can be determined as described in the ELECTRICAL WORLD for March 25, on page 587, the foreman is in a position to authorize the number of boilers to be brought into steaming or to be taken out of service, depending on the load. This load, in the instance of the Boston Edison Company, is indicated on a load sign in the generating station. At this point the fireman's duty begins. The procedure adopted by the Boston company follows:

With the knowledge of the load to be carried and the number of boilers that must be kept under steam to carry this load, the firemen refer to a curve that indicates how much coal must be burned in each furnace to produce the necessary steam. Since the tachometers attached to the stoker are calibrated in pounds of coal being fed, the stoker feed can be adjusted to the desired rate. On the tachometers are secondary scales which indicate the approximate air pressure to be maintained in order to supply the right amount of excess air to burn the coal. This instrument and others which are required by the firemen to determine the condition under which the boilers are operating are placed on the front of the boiler, as shown in the accompanying illustration.

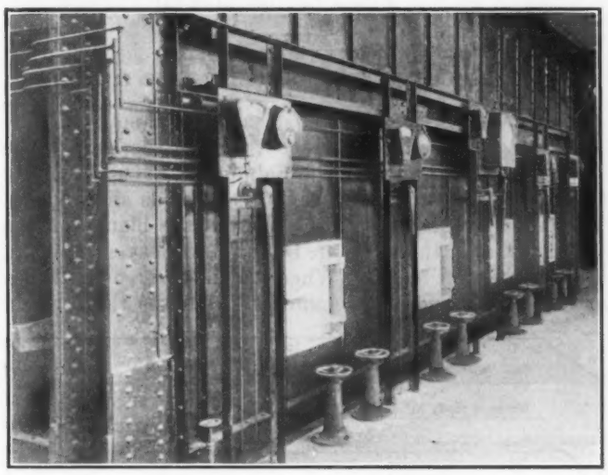
If induced-draft fans are in service, the next step is to regulate this speed so that the draft over the fire is about one-tenth of an inch.

After the boilers are under steam, the steam-flow

meters enable the firemen to keep them operating at the proper rating. If the steam flow or pressure indications are unsatisfactory, the firemen take the usual steps to correct the condition, but are instructed to keep in mind the policy of the company, namely, "Service first, efficiency second." The provision of air-flow indicators enables the firemen to maintain the right amount of excess air.

The efficiency in the boiler room alone cannot serve as a criterion for judging the good work of the firemen and the design of the plant, Messrs. Moultrop and Dillon pointed out. It is the combined efficiency of the boiler room and turbine room which is most important. Too often it is believed that the measure of efficiency is the loss to the ashpit and up the stack. However, this loss must be weighed against the loss of heat to the circulating water in the condenser. Feed water can be heated throughout the greater part of the temperature range from either of these two sources of heat. The source of heat to employ is one which will give the best over-all plant efficiency.

Quite apart from boiler-room operating methods but



METERS AND CONTROL ON BOILERS ENABLE THE FIREMEN TO MAINTAIN THE MOST ECONOMICAL OPERATING CONDITIONS

having a decided influence on economy are the conditions under which the men work. Present-day boiler rooms are much more comfortable than formerly. It is now an established practice to spare no expense in making conditions safe and eliminating accident hazards, providing plenty of light everywhere around machinery, allowing plenty of space and keeping the stations clean. The additional expense that has been put into stations to improve conditions has given a high return on investment. This contributes a great deal toward efficiency.

New York. FIELD EDITOR ELECTRICAL WORLD.

Water-Barrel Arresters

IN THE article on water-barrel arresters published on page 586 of the ELECTRICAL WORLD of March 25 there is an error in the dimensions of the electrode. It reads, "The electrodes are 3-ft. x 3-ft. x $\frac{1}{8}$-in. copper," etc., but it should read "3-in. x 3-in. x $\frac{1}{8}$-in. copper," etc. This is misleading as it would be difficult to put this size sheet into a barrel.

H. M. KING,
Electrical Supervisor.
Ontario Power Company of Niagara Falls,
Niagara Falls, Ont.

Electric Drive and Push-Button Control Increase Plant Production

WHERE continuity and speed of production are of utmost importance, as is the case in most plants, the layout of individual motors with their starting and protecting equipment should be made with extreme care. The motors and auxiliaries must be kept out of the way of operators, but the control must always be within convenient reach. At the same time the motors must be protected so that an operator cannot overload them for any length of time, with resulting damage. A recent installation that combines these safety and convenience features in a practical manner is the Keystone Spring Works at Philadelphia. The motors, mounted at the ceiling, are controlled at the machine, as may be seen in the illustration, by push-buttons which operate magnetically closed circuit breakers, also mounted at the ceiling. Protection is afforded by thermal relays. The recent change-over in this plant from steam to electric drive has resulted in an increase of production of approximately 20 per cent.

OPERATING CONDITIONS SEVERE

Owing to the fact that a number of the machines, like the rollers and presses, have heavy flywheels and to the abnormally high room temperature caused by hot gases from furnaces and forges, the motors have to start and operate under unusually severe conditions. Thirty Triumph motors ranging in size from 1 hp. to 5 hp. are installed, being mounted on the ceiling beams and belt-connected to the machines. The circuit for each motor passes through a Square-D safety switch installed above the machine on the ceiling beams. These switches are bolted to two strap-iron pieces which are screwed to the sides of the joists or beams. On the same strap-iron supports, immediately below the safety switches, are bolted Monitor "thermaload" starters inclosed in steel boxes. They consist of a small air-break circuit breaker and overload relay, the operation of which will be described later. Start and stop push-buttons are mounted on the machines in the most accessible position, this being possible without interfering with work on the machine because of the small size of the control boxes. The accompanying photograph shows how unobtrusive and convenient the control is.

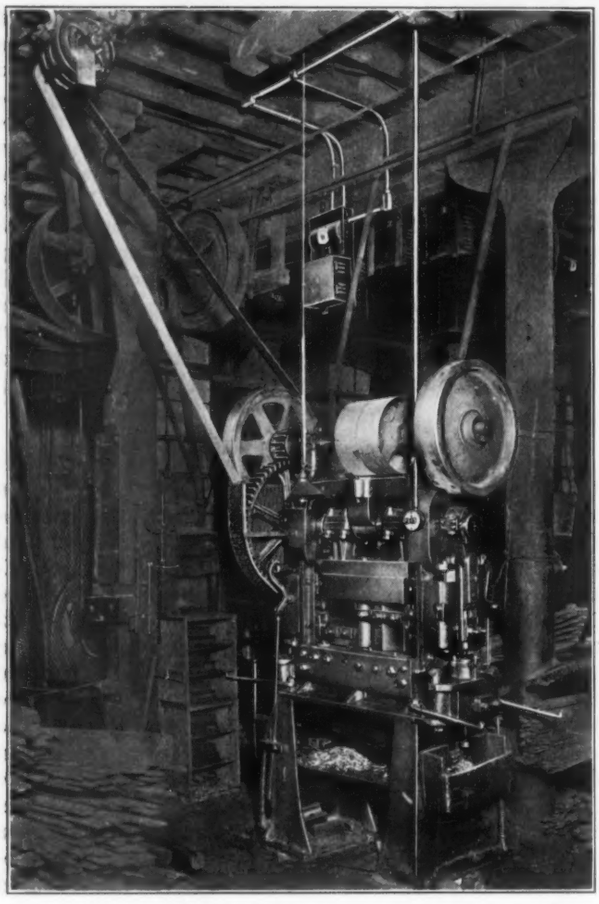
The starters connect the motors directly to the line. When the starting button is pressed a solenoid is energized, thereby closing the circuit breaker. Only momentary pressure of the button is needed as an auxiliary contact made upon closure of the breakers maintains the circuit through the solenoid. When the "stop" button is pressed the solenoid circuit opens, thus releasing the breaker. On overload a relay opens the solenoid circuit and thus shuts down the motor.

The relay depends for its action on the expansion of a corrugated metal tube when heated by a thermal element in series with the line. The tube has double walls inclosing a liquid which expands on being heated. When the tube expands to a certain length it opens the circuit to the solenoid. Whenever the breaker is open it can be closed only by pressing the control button. An excellent feature of such protection is that momentary overloads do not raise the temperature of the expansion unit sufficiently to open the circuit.

Low voltage will cause the holding solenoid to release the contactor and open the circuit. Failure of one phase

will trip the relay provided the current drawn by the motor is sufficient to damage the motor.

The replacement of steam drive by this electrical installation has not only improved conditions of the plant as a whole, eliminating noise, dirt and confusion, but it has also increased the production capacity. Heretofore the capacity was 35 tons of springs per month.



PUSH-BUTTON CONTROL ON FRAME OF MACHINE WITHIN EASY REACH OF OPERATOR

It is now more than 42 tons per month. In addition, there has been a considerable saving in time, labor, materials for repairs, etc. Departments are now independent, work can be performed outside of regular business hours without increased cost, and it is no longer necessary to start up the entire plant when a small rush repair job is ordered. THOMAS W. C. HARTMANN,
Keystone Spring Works, Inc., Engineer.
Philadelphia, Pa.

Common Grounded Neutral for Alternating and Direct-Current Systems

IN CONSOLIDATING the old Dallas Ice Facory, Light & Power Company's three-wire, 110/220-volt alternating-current secondary buses with the Dallas Power & Light Company's buses, it was also decided tc combine the neutral of the alternating-current secondary system with that of the existing three-wire, 250/550-volt direct-current commercial power system. The direct-current neutral is continuous throughout the system and is grounded at only one location. This ground is in the substation, and the neutral is connected solidly. This affords a large-capacity, low-resistance ground for both classes of service through only one conductor, resulting in a substantial saving of copper, since the downtown buses are quite heavy owing to the large load. Another advantage gained through eliminating one neutral is that of affording an additional pin space on the pole, which is often badly needed in this congested district. This use of the direct-current neutral also eliminates the necessity of grounding each alternating-current secondary bus separately, as is done in residential sections.

So far no operating difficulties have been experienced with this system, and it is probable that the only objection which could be advanced is a possibility of one of the 500-volt direct-current mains coming into contact with one of the 220-volt alternating-current mains and carrying 250-volt direct current into 110-volt or 220-volt alternating-current apparatus, causing damage by burnouts before the individual fuses of the services would operate—assuming that adequate fuse protection is present, which is not always the case.

Chicago, Ill. FIELD EDITOR ELECTRICAL WORLD.

Meter Records Checked by Use of Tags

IN ORDER to keep track of all meter sets and removals, when a meter is sent out of the shop to be set at the Lowell mine of the Calumet & Arizona Mining Company, it has tied to it one of the cards shown here. The man who sets the meter fills out the blanks on the side marked "Installation Data" and leaves the tag attached to the meter. When the meter reader comes around at the end of the month he removes the tag and returns it to the office for filing. If a meter is to be removed the card is taken from the file and the reverse side of the card filled out with the "Removal Data." The card is attached to the meter and taken to the shop.

INSTALLATION DATA

Meter is ready for use ____ Meterman

Date ____ Time ____ Reading ____

Location ____

P. T. Mfrs. No. ____ Pri. V. ____ Sec. V. ____ Ratio ____

C. T. Mfrs. No. ____ Pri. Amps. ____ Sec. Amps. ____ Ratio ____

This tag to be returned to Electric Office

Electrician

REMOVAL DATA

Make ____ Type ____ Mfrs. No. ____

Date ____ Time ____ Reading ____

Location ____

Reason for Removal ____

Electrician

METERS CANNOT BE LOST TRACK OF WHEN THESE CARDS ARE USED

Calumet & Arizona Mining Co., W. R. GIBSON,
Warren, Ariz. Chief Electrician.

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

Central-Station Executives Should Visit Appliance Factories

By Cyrus Barnes

General Sales Manager, Charles H. Tenney & Company, Boston

EXECUTIVES of central-station companies who fail to visit appliance factories within reasonable reach of their headquarters miss a real opportunity. Too often in the past the appliance department of the central station has been looked upon more or less as a means to an end, and the magnitude of the business, the capital invested in appliance production and the possibilities of sales development in the company's own organization are still often underestimated. Both for the higher executives of a company and for the department heads, it is worth while to spend time and money in getting into closer contact with the manufacturers in their own establishments.

CYRUS BARNES

It goes without saying that the commercial department executive should welcome the opportunity to visit the appliance factory, and where a number of central stations are operated in group a prearranged visit of commercial department representatives to a factory of this sort can often be arranged with benefit to all concerned. For the past two years visits of this kind have been made by members of our own organization to the number of at least three or four per annum. These visits include a group of sales department executives from various central stations, and at least one day is set apart for factory inspection and for informal discussion with manufacturers' representatives of points of mutual interest. It is almost equally valuable for the executives of a single central station, including the heads of various departments, to join forces in a group trip to an appliance factory, because of the opportunity to study the developments in progress and possibilities of new apparatus and devices for use by central-station customers.

Where the central-station group meets the factory group at close range for mutual discussion and interchange of experience and views, great good may result. The sight of hundreds of toasters, percolators, vacuum cleaners, etc., lined up in the factory in process of manufacture, testing and in preparation for shipment corrects the perspective of many a visitor as to the importance of that branch of the industry. At the factory a real understanding of the quality of workmanship on appliances is given to the receptive visitor, and some inkling of the importance of mass production as a factor in cutting down overhead and operating expenses is pretty sure to be acquired. The trend of new product designing is often in evidence, with advance information as to devices soon to be marketed. Knowledge of how the devices are put together is more quickly acquired here by the group of visitors than would otherwise be probable. Acquaintance with individuals in the manufacturing organization develops favorably under the conditions of the visit.

To the manufacturer such occasions furnish unusually good opportunities to emphasize features of the product and of the methods used in its manufacture, but, perhaps best of all, the contact with outsiders who are all directly or indirectly interested in marketing these devices yields most valuable data on service performance. The reactions of the ultimate consumer to specific methods of selling, his acceptance and his criticisms of designs and service results, interpreted by the merchandising knowledge of the sales staff of the central-station company and the judgment of company executives, all guide the alert manufacturer in the production of his equipment. In ordinary correspondence many points of this kind may, of course, be taken up, but where a group of interested persons concentrate attention upon such matters amid the surroundings of the factory there may well be a stimulus toward constructive criticism and discussion that would be practically unattainable under the restrictions of letter writing. The cost of such trips to a company will be repaid many times in sales results, and the industry and the consuming public will benefit by this group interpretation of service requirements and of the problems of manufacture and distribution.

Pacific Gas & Electric Makes Itself a Personality by Advertising

THE advertisements on the next page are typical of a series by which the Pacific Gas & Electric Company is endeavoring to humanize the company in the mind of the public and to keep its customers "sold" on its service. In these days of open discussion of public utilities and their methods it was deemed important that the people should realize how much of a "home" industry the company is.

By means of this constructive campaign the company aims not only to increase the use of its service, but also to foster and keep alive the good will and esteem of the people of the state. While the bogie of public ownership of the utilities is ever present, the danger is small when patrons generally understand that its great servant is honestly striving to do the best it can. The Pacific Gas & Electric Company believes the small cost of thus selling itself and its service to customers

Hugging an Icicle
to repair your Power Line
WHEN THE MOUNTAINS are hidden behind a swirling blanket of snow, think of the P. G. and E. men who are toiling for you up there in the freezing cold.
During severe storms, wires break under the weight of accumulated ice and snow. Poles are blown over or go down under the weight of wires covered with ice. Ice forms on the poles as much as 12 inches thick, making them veritable icicles.
Climbing icicles is only one phase of the war between P. G. and E. men and the elements. Instance after instance can be cited to illustrate the disregard of personal inconvenience and obstacles that is characteristic of this Company and its personnel when service to customers is threatened.
Notwithstanding the obstacles which must be overcome in maintaining service, the rates have been steadily reduced during the past twenty-five years.
PACIFIC GAS AND ELECTRIC COMPANY
P·G·and E·
"PACIFIC SERVICE"
The Mightiest Servant in California
PICTURE in your mind a strong, tireless servant—one ever alert—one that constantly serves, day and night, over 1,700,000 people.
Think of a servant so domesticated that it warms, lights, and makes comfortable the homes of the land—a vigorously powerful thing that it whirls the massive wheels of factories and hauls trains at breakneck speed.
The Pacific Gas and Electric Company is such a servant. It serves, with equal fidelity, the poor and the rich. Its service lightens the burden of housewives. It enables the farmers to take advantage of labor-and time-saving devices. Industries rely upon it for power, light, and fuel.
The huge arms of this servant embrace an area as large as that covered by seven Eastern states. The most enterprising, prosperous section in the West commends its allegiance.
Service is the only thing this Company has to sell—a service to great—important—necessary—that enthusiasm, disaster, and even loss of life would result if it were not constantly maintained.
Such service does not savor of servitude. It calls for the highest ability and the most steadfast purpose inherited by man.
PACIFIC GAS AND ELECTRIC COMPANY
P·G·and E·
"PACIFIC SERVICE"
Old Schoolmates and Friends operate the P·G·and E·
Do you remember Billy Dash, that big, freckled-faced boy who was such a good ball player during the old school days? Well, Bill is now one of the officials of the Pacific Gas and Electric Company. He's just as good an official as he was a ball player, too!
And old neighbor Blank's boy, the one who had such a knack at figures, is one of the best engineers in the West today—he's holding down a responsible job with this organization.
So it goes. The vast army of men and women who are operating the P. G. and E. are very human people indeed. Joe Doe is a lineman—he hopes to send his oldest boy to an engineering school. Mary Smith is helping to support her widowed mother by acting as a stenographer at one of the offices.
When one stops to think about it—that flesh-and-blood people are working for you, and sharing the same human thoughts and aspirations with you—a public utility concern like this doesn't seem so cold and unfeeling, does it?
PACIFIC GAS AND ELECTRIC COMPANY
P·G·and E·
"PACIFIC SERVICE"

TYPICAL ADVERTISEMENTS WHICH PUT FLESH AND BLOOD INTO "SOULLESS CORPORATIONS"

makes business relations pleasant and profitable and furthermore provides an insurance for the continuation of these two desirable conditions.

Wisconsin Farm-Owned Lines Show a Deficit

AN INTERESTING and significant study of the losses in the rural distribution of electrical energy was presented at the recent meeting of the Wisconsin Utilities Association at Milwaukee. The data are for lines that are owned by the farmers and are significant because they are taken from the files of the Railroad Commission. Deficits running all the way from $18 to nearly $68 per consumer are shown. The figures are of particular interest to central-station men who must combat the farmers' idea that the central-station company is making a mint of money out of the service. Not only has the revenue not paid a return on the investment, but depreciation has not been covered in any of the cases, and in some of them the revenue has not covered the current operating expenses. The figures should be valuable to any central-station operator who must handle rural distribution business.

What Other Companies Are Doing

Providence, R. I.—To March 15 of this year the Narragansett Electric Lighting Company has secured 49 per cent more house-wiring contracts than were secured during the same period a year ago. To increase the interest of employees in May and June house-wiring activities, the company is offering a premium of $2 for every new meter application signed as a result of a "lead" furnished by an employee.

St. Louis, Mo.—Through the savings and loan association, formed by employees of the United Railways of St. Louis, 746 employees of the company have been enabled to build their own homes within the past six years, and others are building or buying at the rate of from ten to fifteen every month.

Chicago, Ill.—H. M. Byllesby & Company are distributing a new illustrated circular describing the development and growth of the Northern States Power Company. This circular contains a map of the territory served which illustrates graphically the power sources. The population served by this company has increased 319 per cent in eleven years; the gross earnings have increased in this period 304 per cent.

DATA ON CERTAIN RURAL ELECTRIC LINES IN WISCONSIN OWNED BY THE FARMERS

Company	Average Rate First 50 Kw.-Hr., Cents	Minimum Monthly Charge	Revenues, 1921	Expenses, 1921	Amount Left for Return and Depreciation, 1921	Minimum Depreciation Requirement, 1921	Minimum Return, 1921	Deficit for 1921	Deficit per Consumer, 1921	Average Consumption per Consumer, 1921	Energy Purchased, 1921, Kw.-Hr.	Energy Sold, 1921, Kw.-Hr.	Per Cent Loss
A*	12	$2.00	$4,779.33	$4,774.12	$5.12	$1,633.41	$3,266.88	$4,895.20	$48.95	$46.00	$101,940	55,348	45.7
B	10	1.00	282.70	317.16	— 34.46	140.48	280.96	455.90	56.95	31.00	6,984	2,964	57.4
C	18	3.50	564.91	801.40†	—236.49	360.00	720.00	1,316.49	57.40	9.00	9,240	2,518	73.0
D	15	3.50	498.06	464.54	33.52	133.00	266.00	365.48	30.46	.....	5,477	.....	.....
E	10.1‡	‖	2,681.54§	2,348.18§	333.36§	653.31§	1,306.69§	1,626.64§	27.11	41.0	30,701	17,182	44.0
F	13.2	3.50	922.65	796.21	126.44	140.00	280.00	293.56	21.00	.....	10,938	.....	.....
G	14	2.00	85.18	151.92	— 66.74	156.46	312.93	262.29	37.60	.....	1,340¶	.....	.....
H	30	.....	1,507.07	1,381.89	125.18	368.00	736.00	978.82	36.50	43.5	49,400	14,140	71.6
I	13	.....	.....	.....	.....	70.00	140.00	510.00**	67.75††	.....	.....	.....	.....
J	9.8	‡‡	1,638.81	1,195.31	443.50	461.00	922.00	939.50	24.60	21.6	22,260	9,856	56.0
K	11.2	1.50	1,129.09	1,264.99	—135.90	261.00	522.00	918.90	23.60	22.6	36,804	10,600	71.0
L	.....	.....	941.06	1,167.78	—226.72	140.92	281.84	649.48	23.20	.....	7,941	.....	.....
M	12	1.25	407.24	327.16	80.08	132.80	265.60	318.32	18.70	.....	‡9,171	.....	.....

* Company has grist mill on line which consumes about 1,000 kw.-hr. annually. † Cost of energy plus meter reading, labor only. ‡ Minus 1 cent discount. ‖ Rural charge, 1½-kva. transformer $2.50, 3-kva. $3.50, effective last two months. § Seven months only. ¶ Five months only. ** Yearly requirement for minimum bill, depreciation and return. †† Same as ** per consumer. ‡‡ Demand charge of $1 per month added.

Manufacturing and Distributing

Devoted to the Discussion of Production, Distribution and Market Development, the Business and Economic Problems of the Manufacturer, Jobber, Agent, Contractor and Dealer

The Way that Export Business Must Be Won

By E. W. Droosten
Export Manager, Robbins & Myers Company, Springfield, Ohio

ASK the experienced export manager today what lessons in foreign trade the last few years have taught him and there is only one sure answer that he can give. He will say: "I have learned that I do not know a lot of things that I thought I knew." In other words, so many new conditions have arisen that it has often been a very hard matter to know just what to do in some of these situations. The matter of passing on foreign credits under existing circumstances, and determining how much time we should extend to a foreign buyer, is extremely difficult. Just what to do when asked for extensions on outstanding drafts or where drafts were refused for one reason or another merely to get out of paying them on account of the deterioration in exchange or late shipments or prices made by our competitors is perplexing.

E. W. DROOSTEN

The whole situation has been undergoing a change, so that I do not feel that we can take conditions covering foreign trade in the last four or five years as a precedent for the future. Rather, we have got to begin all over again and couple with our past experience our best judgment as to what we should do in the way of going after foreign business from now on.

The matter of delivery is all-important, as the foreign buyer is a long way from the source of supply. He has to figure, even at best, that when he places an order it will take from two to six months before he can get his goods. And when it is a matter of a year before he receives them—which I have known to be the case frequently—he is without the stock of goods that he has figured on having, and this means a loss to him with his expenses going on just the same. So if we want to build up a foreign trade for America, we should be particular that the export orders which are received by the various manufacturers and producers in the United States get prompt attention and that prompt shipment is made. Moreover, the packing of our goods should be carefully looked into so that they may arrive in the best possible condition and no errors be made, as it takes a long time to rectify mistakes and they are bound to be expensive to some one and cause dissatisfaction.

In many instances the trouble with American manufacturers has been that when business was good in this country they did not give their export orders the proper attention. They have neglected their foreign customers, giving the domestic business the preference. When a slack time comes these manufacturers and producers look anxiously to the foreign countries for business, forgetting that it takes a long time to build up an export business, and that when this has been accomplished it is necessary to do everything that can be thought of to hold it so that it will be there when it is wanted.

My advice to manufacturers and producers in this country would be not to attempt foreign trade unless they intend seriously to make it a part of their business and not to look upon the foreign market as a secondary consideration or as a dumping ground for left-over or imperfect goods. By giving this matter the attention it would have from England, Germany, France or Italy, or in fact any of the European countries that are considered to be our competitors, we can expect to hold and increase our foreign business even if our competitors quote lower prices and make more attractive propositions. The foreign buyer realizes that he is a long distance from the market of supply, and if we are able to give him the service so that he gets what he orders within a reasonable time and his goods arrive in good shape so that he can go on with his business, he appreciates it more than price. By rendering this service, therefore, we can make it very difficult for any one to take the business away from us.

Much, of course, depends upon the men who are employed as salesmen and sent out into the foreign countries to solicit for American firms. An honest representation is vital, and so is the fulfillment of promises in giving full weights, in maintaining the standard of the goods that are shipped so that they are as represented to the foreign buyers, and a "give-and-take" policy. We must always bear in mind that the foreign buyer has his side of the question as well as we ours, and that he appreciates it when we study his interests and welfare.

The Need of Educating the Public on Quality Wiring

By T. E. Bibbins
President Pacific States Electric Company, San Francisco

AS THE electrical business is now conducted the control of the number of outlets installed on each job is virtually in the hands of the electrical contractor. In the contractor's contact with the owner is determined the sum total of the potential assets of the business—the number of outlets to be installed. Such things as professional and technical standards in the electrical contracting business receive little consideration from the general public.

A citizen who purchases, builds or rents a house wired for the use of electricity is entitled to the complete service which a competent job of wiring implies. As the matter stands today, at least 75 per cent of such buildings are equipped with "stepladder" installations only. In other words, the occupant is compelled to stand on a chair to remove a lamp from its socket or to get any approximation to the use he should have from the energy delivered. It is estimated that 25 per cent of the convenience appliances sold are not in use because of inadequate wiring.

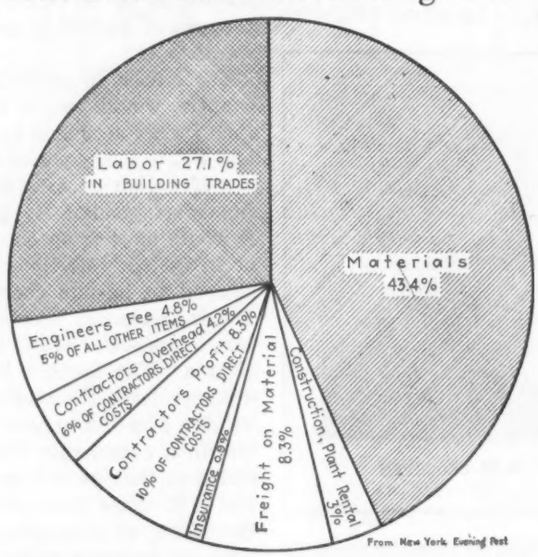
In the past the contractors on the Pacific Coast have divided themselves into two groups, one consisting of well-established contractors, who do business on the basis of good workmanship, standard materials and fair prices, and the other group composed of irresponsible casual contractors, who deal entirely upon the basis of price. A survey of the Los Angeles territory, for instance, shows that qualified contractors during 1920 obtained about 58 per cent of the total number of jobs, installed 60 per cent of the outlets and averaged 14 outlets per job. In 1920 the other group of contractors obtained 42 per cent of the jobs, installed 40 per cent of the outlets and averaged 12.8 outlets per job. In 1921 the qualified contractors obtained only 27 per cent of the jobs, installed only 39 per cent of the outlets, but averaged 15.8 outlets per job. The other group in 1921 averaged 73 per cent of the jobs, installed 61 per cent of the outlets, but averaged only 8.5 outlets per job.

The obvious deduction from these facts is that the irresponsible contractor is definitely reducing the potential market for all electrical products and service by failing to take advantage of the natural demand. What is more important, he is imposing unsatisfactory service upon the public. The difficulty is that the average person knows nothing about contracting service, except in the terms of cost.

The difference between a competent installation made by a qualified contractor and the cut-price kind is only about one-half of 1 per cent of the value of the building—$50 on a $10,000 house. When owners are brought to understand that this small increase in cost carries completeness and permanent satisfaction in the use of electricity and is not merely an additional profit to the contractor, confidence will be established and the business will take a normal course of proper development.

Such public education, I believe, can be accomplished only through broadcast newspaper advertising, and no single company or organization can hope single-handed to accomplish the results completely. It is desirable that all manufacturers, wholesalers and power companies shall join in this educational work and that every effort shall be made to assist contractors in a sound development of that end of the business, because upon it depends the development of the whole industry.

The Distribution of Building Costs



WITH the increase in building activity this chart is deserving of considerable study by the manufacturer and jobber of wiring material and the electrical contractor. It shows in proportion the elements in the cost of a typical industrial building and offers a basis for comparison in analyzing the cost factors of the electrical installation.

Real Profit in the Elimination of an Excess Variety of Products

THE important relation which standardization of products and the discontinuance of unnecessary types of what is virtually one article bear to profit has not been fully appreciated by all manufacturers, jobbers or dealers. A careful survey of the gains which are certain to accrue through an intelligent program of standardization and elimination of excessive variation has been made by the Fabricated Production Department of the Chamber of Commerce of the United States. The gains to be realized by the manufacturer have been listed as follows:

1. Less capital tied up in raw materials, semi-finished stock, finished stock, jigs, dies, templates and special machinery, storage floor space and repair parts.
2. More economical manufacture through larger units of production, reduced number of manufacturing units, longer runs, less frequent changes, higher rates of individual production, accurate and proper estimating for production, more effective stock control, better and more simplified inspection, less idle equipment, reduced amount of equipment, simplified and more accurate costing system, elimination of waste in experimentation and design, and standardized material inventories.
3. More efficient labor due to making the training of employees more simple, better earnings through increased individual production made possible by longer runs, happier and more contented workmen, skill increased by repetitive process, less labor idle from preventable causes.
4. Better service to the trade in better quality of product, more prompt delivery, decreased quantity of sizes of packing required, fewer packages broken in transit, less chance of errors in shipment, and less obsolete material.
5. More efficient sales force.
6. Increased rate of turnover.
7. Intensified sales momentum.
8. Easier financing.
9. Fewer factory shutdowns.
10. Compels attention to individuality in those features where there should be individuality, by preventing attempts at individuality in those features where individuality is superficial and useless and where standardization and quality should prevail.
11. Earlier plans and schedules.
12. Decrease in number of production processes.

The jobber and dealer will profit from these advantages:

1. Increased rate of turnover due to all live numbers (none obsolete), elimination of slow-moving stock, staple line, easy to buy, quick to sell, more effective sales force, greater concentration of sales on fewer items, and standard patterns that are proved best sellers.
2. Decreased capital investment in stock on hand, repair parts on hand and storage space required.
3. Less stock depreciation and obsolescence.
4. Decreased overhead on handling charges and clerical work.
5. Better service through lower prices and quicker and more reliable deliveries.

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Propagation of Traveling Waves in Transformers.—H. MASSING.—In this mathematical paper the author tries to determine how the self-induction of a transformer, its capacity between coils and its capacity from coils to case will affect an oncoming current wave with steep or sinusoidal form. A purely mathematical solution, the author admits, is very difficult and in the end uncertain, for which reason only the general form of the calculations is indicated. This suffices to give quantitative results, which can be verified by actual experience.—*Revue Générale de l'Electricité*, Jan. 21, 1922.

Things That Cause Trouble in Reversing-Roll Electric Drives.—A. J. WHITCOMB.—Uninterrupted operation and low maintenance costs of large steel-mill drives depend upon the correct functioning of a large number of individual elements. The failure of any one of them may stop or damage a large part of the mill output. Attention to details is essential. Just what kind of attention is needed and how it can be organized into a definite maintenance schedule are outlined in this article. After a machine is shut down for the week end a detailed investigation should be made of the commutator for high or low spots, and the machine ground down if necessary. Brushes should be closely inspected for binding in the holder, broken ends or edges and ridges. The slip rings should also be examined.—*Electrical Review and Industrial Engineer*, February, 1922.

Generation, Transmission and Distribution

The Blackburn (England) Power Station.—L. C. KEMP.—A very complete description is given of this English plant, recently constructed. It consists of two 10,000-kw., 1,500-r.p.m. turbo-alternator units, designed to operate with steam at a pressure of 200 lb. per square inch and 200 deg. Fahr. superheat. The alternators generate 6,600 volts at 50 cycles and have a two-hour overload rating of 20 per cent. The coal-handling apparatus, cooling towers and circulating water system, switchgear and transformers, protective apparatus and metering equipment are discussed.—*Electric Journal (England)*, January, 1922.

Traction

Transformation of Three-Phase Current Into Direct Current.—FR. KADE and CH. KRÄMER.—The authors attempt by analyzing the characteristics of different rotating machines and rectifiers to decide in which cases one or another of them should be used, but admit that no definite decision can yet be made. In the first part of the article Mr. Kade explains the limitations of rotating machines used chiefly for this transformation. In the second part of the paper Mr. Krämer gives a general explanation of the valve action of a mercury arc and its use for rectifying purposes. A photo of a giant rectifier of 2,000 amp. at 1,200 volts, built by the A. E. G., is shown. With the exceptions that it does not work both ways and that it shows low efficiency for less than 220 volts direct current, there is nothing a rectifier could not do when compared with rotating machines. In addition, its efficiency is virtually independent of the load. The old question of the best current system for main railroad electrification has again been taken up since the rectifier permits of a simple, effective and cheap alternating-current-direct-current transformation, with no more no-load losses than a transformer. This has given a considerable impetus to the direct-current system in Germany, where the alternating-current system is now established as a federal standard.—*Elektrotechnische Zeitschrift*, Jan. 26, 1922.

Lamps and Lighting

The Lighting of Metal-Working Plants.—A. L. POWELL.—Localized lighting was the first method used for shop lighting. It still has advantages for certain operations, but has been commonly superseded by general illumination with more efficient, larger lamps. In metal-working plants where extremely fine work or internal boring is being carried on the high intensity or direction of light necessary may compel the installation of drop lamps, but these should always be supplemented with general illumination. Glare in the workman's eyes due to unshielded lamps should be carefully avoided, for it produces an effect upon the eye which not only reduces its sensitiveness but also tires the entire body. The best means of avoiding glare is the use of proper reflector equipment. Detailed recommendations are made for machine-tool work, sheet-metal work and assembling rooms.—*Bulletin L. D. 134, Edison Lamp Works.*

Installations, Systems and Appliances

Insulating Material for Electric Appliances.—A consideration of the requirements of insulating materials for electrical appliances such as mica, fireclay, porcelain, quartz and refined alundum. The chief requirements are that the materials must be refractory, must be good non-conductors both of heat and electricity and must have a low thermal capacity. They should be of reasonable mechanical strength with a low temperature coefficient of expansion.—*Electrical Times*, Feb. 2, 1922.

Electric Ventilating.—W. T. REACE and G. C. BREIDERT.—Electrically operated ventilating equipment has reached a high state of effectiveness and efficiency and is being used extensively in both industrial and commercial establishments. Methods are described in this article for making stores and restaurants attractive to patrons by providing a constant supply of pure, fresh air and avoiding any possibility of tainted odors. The necessity of promptly removing disagreeable gases, vapors or dust from factories is explained. The increased production resulting from a continuous supply of fresh air to workers throughout the factory is becoming widely recognized.—*Electric Journal*, March, 1922.

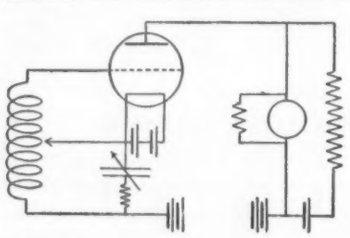
Analysis and Control of Factory Transportation.—F. A. POPE.—Methods by which idle time is checked, performance records of tires and batteries best secured, daily service recorded, and the final analysis of cost and performance made.—*Factory*, January, 1922.

Wires, Wiring and Conduits

Ferranti System of Automatic Cable Protection.—P. TESTARD.—If a two-phase or three-phase cable is surrounded by a closed magnetic core on which is a single winding, no flux will be created in the core as long as the cable is sound, because the sum of the two or three currents flowing through the cable is zero at any instant. If, however, one of the phases becomes accidentally grounded, this equilibrium will be disturbed, a magnetic flux will be established in the core, and the current induced under such circumstances in the winding upon the core can be used to energize a relay to disconnect the faulty cable. In the case of double-feeder systems a selective cable protection may be established with a proper arrangement of four such special transformers and relays per cable pair, as is shown diagrammatically in the paper. The feeders of the Parisian electric distributing network are equipped with this Ferranti system. The method will not protect cables against short circuits or accidental rupture of one of the phases. As, however, 99 per cent of short circuits or the opening of phases are accompanied with a grounding, the system operates to full satisfaction. A few of its advantages are simplicity, the absence of any pilot wires, sensitiveness, considerable stability and the absence of voltage coils in the relays.—***Revue Générale de l'Electricité***, Feb. 18, 1922.

Electrochemistry and Batteries

Resistance of Electrolytes at High Frequencies.—JOHN J. DOWLING and KATHERINE M. PRESTON.—Methods of utilizing high-frequency oscillation valve circuits for the measurement of resistance have been



OSCILLATION CIRCUIT USED FOR PRECISION MEASUREMENT OF METALLIC AND ELECTROLYTIC RESISTANCES

devised and are described in this article. These methods are capable of great precision and are suitable both for metallic and electrolytic resistances. Tests indicate that ordinary electrolytes offer the same resistance to high-frequency as to low-frequency currents. The frequency used was about 750,000 cycles.—*Philosophical Magazine (London)*, March, 1922.

Electrophysics and Magnetism

Absorption of Narrow X-Ray Beams.—P. W. BURBRIDGE.—An investigation of X-rays made to ascertain whether at very small angles there was any large scattering effect. — *Philosophical Magazine (London)*, February, 1922.

The Design of Liquid Rheostats.—W. WILSON.—The main object of this paper is to determine more definitely the constants of the liquid rheostat and the more exact prediction of its performance. The phenomena occurring in such a rheostat under a wide variety of circumstances are considered, a distinction being drawn between the behavior of direct and of alternating currents in the apparatus. Tests are described which bear out and amplify the conclusions, many of which are characterized by the employment of current densities many times larger than those generally considered to fall within the limits of safety.—*Journal of (British) Institution of Electrical Engineers*, February, 1922.

Units, Measurements and Instruments

Method of Measuring Coil Capacities and Standardizing Wavemeters.—GREGORY BREIT.—A method is worked out for the adjustment of two frequencies to have an accurately known ratio. This is based on the fact that an electron tube detector distorts the wave form of the emf. impressed on it and thus produces harmonics in its output. These harmonics are made to give beats with the fundamental of a circuit of fixed frequency and are rectified in an amplifier to give a musical note. The applications of this method to wave-length standardization and to coil capacity measurements are described. —*Radio Review*, February, 1922.

Dielectric Strength of Slate.—D. F. MINER.—In this article the author gives the various mechanical and electrical tests to determine the suitability of slate for switchboards. In the mechanical tests strength against bending stresses is the principal gage. The electrical test includes investigations for leakage and dielectric strength and exploration for metallic veins. The methods explained for determining insulation, resistance and leakage are (a) by a portable testing transformer, (b) by the megger test, (c) by a high-voltage direct current, (d) polarization time with high-voltage direct current, (e) leakage-current measurement with alternating current, (f) power measurement with alternating current.—*Electric Journal*, March 1922.

Telegraphy, Telephony and Signals

Telephone Receiver with Increased Sound Intensity.—G. SEIBT.—The author found it possible to increase the sound intensity of a telephone receiver by laminating the pole pieces above the poles of the permanent magnet and by introducing a magnetic shunt just below the coils. The polepiece laminas are made of 4 per cent silicon steel of 0.25 mm. thickness. The magnetic shunt air gap was found to be most effective when set to about 2 mm. The membrane is made of the same steel as the pole-piece laminas, instead of the previously used American ferro-type steel of 0.16 mm. Tests made with such receivers showed an increase of sound intensity of from two to two and four-tenths times that of the old model. This new receiver is already being made on a large scale.—*Elektrotechnische Zeitschrift*, March 2, 1922.

Directional Transmission of Electromagnetic Waves for Navigational Purposes.—J. ERSKINE-MURRAY and J. ROBINSON.—The paper analyzes the differences between directional transmission and reception as used in navigation and describes in particular a number of directional transmission methods which have been developed by the Royal Air Force of England. The methods include several in which the determination of a bearing depends on the timing of the moment of equality of signals as heard in the receiver, and also a new class of directional transmitters in which a characteristic of the radiation, such as a particular wave length, is allotted to each direction in azimuth.—*Electrician (London)*, March 17, 1922.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Improvement in Employment Situation Among Engineers

ACCORDING to reports from the Employment Bureau of the Federated American Engineering Societies, the records of the first quarter of 1922 indicate a distinct improvement in the employment situation in the engineering profession. There was a 41 per cent increase in the number of men placed by the bureau and over 100 per cent increase in the number of available positions listed with the bureau as compared with the same quarter for the year 1921.

The bureau reports that there is a notable increase in the number of higher-grade openings which are reported, indicating in the mind of the bureau that many companies are actively preparing for a return to more normal business conditions. The bureau also says that the gradually increasing activity does not appear to be confined to any particular line, but is more or less general.

World Power Conference Scheduled for London

THE council of the British Electrical and Allied Manufacturers' Association has authorized the director of the association to promote a world power conference, the object of which will be to bring together in London experts from all parts of the world to discuss the important subject of "power" in its many aspects. By permission of the executive council of the British Empire Exhibition the conference will be held at Wembley during the spring or early summer of 1924. Invitations have been extended to technical institutions and trade organizations to co-operate in the enterprise. The free use of a conference hall at the exhibition has been granted by the exhibition authorities, who have also agreed to provide for the entertainment of foreign guests. So far as we have been able to learn invitations have not been received in this country as yet.

Royal Commission Appointed to Investigate Chippawa Project

A ROYAL commission has been appointed by the Ontario government to investigate the Queenston-Chippawa hydro-electric development of the Hydro-Electric Power Commission of Ontario. This investigation has been in the mind of the Drury government for some time. The commission is to consist of Walter D. Gregory, lawyer of Toronto, chairman; Michael J. Haney, civil engineer of Port Credit; Lloyd Harris of the Massey-Harris Company of Brantford; James A. Ross, manufacturer of Toronto, and Dr. Robert A. Ross, consulting engineer of Montreal.

Very wide powers are vested in the commission, including the investigation of all estimates given from time to time in connection with the Chippawa development, the reason for their increase, the total cost of the completed project, its capacity, the method of its construction, supervision and management and the extent to which the price of electricity will be affected by the cost of the work.

In addition, the commission is empowered to investigate the Nipigon and any other power development undertaken by the Hydro-Electric Power Commission. The purpose of Premier Drury is to delve into all matters of expenditure and administration by the Hydro-Electric commission. Attempts were made in the Ontario Legislature last week to have the probe made by a committee of the House, but the government urged a royal commission and was sustained.

Hearing on Bacharach Bill Scheduled for Next Week

THE House judiciary committee will hold a hearing on April 25 on the Bacharach bill limiting the jurisdiction of federal courts over the orders of public service commissions. From indications the hearing will be well attended, many mayors, governors, commissioners and other state and city officials having signified their intention of being present.

In addition, representatives of numerous bar associations and public utility corporations are expected to testify against the measure. If enacted into law, public utility companies will lose the right of appeal to the federal courts and must look to state courts for relief from oppressive orders of public service commissions. The passage of such a law is regarded as rather dubious by official Washington.

Would Have Federal Commission to Regulate Trade Associations

AFTER considerable debate the Senate joint resolution creating a committee to study business and recommend to Congress legislation defining rights of trade associations as distinguished from illicit combinations in restraint of trade was referred on Monday to the judiciary committee. Senator Edge, who introduced the resolution, spoke of the recent Hardwood Association decision, and it was pointed out that as a result trade associations do not know what they may and may not do lawfully. A great many associations, it was pointed out, are already considering the advisability of going out of existence.

Senator Edge also proposes in a bill that the Federal Trade Commission or some other body now or to be formed be clothed with authority to advise trade associations on any association activity. The trade associations, if they are to enjoy certain immunities, must

report to this commission in much the same way that the railroads report to the Interstate Commerce Commission.

The matter of trade association activity is receiving unusual attention as the result of the Hardwood decision. Secretary Hoover has endeavored to give to industry an idea of what these associations could do, but this expression of opinion has not removed the element of fear of investigation.

Representatives of four or five hundred such bodies were in Washington last week at the invitation of Secretary Hoover. One of the conclusions that may be drawn from the meeting is that the value of so-called open-price statistics has been exaggerated greatly.

While it was brought out clearly at the meeting that the legality of open-price statistics has not been passed upon, and that associations doing such work cannot be denounced as lawbreakers, particularly when their figures are made public, yet it was made perfectly plain that the Department of Commerce will not co-operate with that type of organization. No one will be surprised if the Department of Justice should institute proceedings against such associations. At any rate, the Department of Commerce is not going to jeopardize its usefulness to other trade associations by co-operating with those which are within the twilight zone.

In this general connection those high in authority are impressed particularly with the inhibition against secrecy which runs through the opinion of the Supreme Court in the Hardwood Lumber case. Since the Supreme Court seems to aim particularly at statistics which are available to members only of associations, the Department of Commerce is interested in giving evidence that publicity is taking place. There is no desire on the part of the department, Secretary Hoover points out, to force any association to file its figures with his bureaus. In fact, the department is entirely out of sympathy with legislation giving actual control over any trade association activity. There are a few instances where statistical information as to important basic commodities is refused by manufacturers.

Colorado River Commission to Meet Again in July or August

AT THE conclusion of the series of hearings which have been held in various centers in the Colorado basin Secretary Hoover, chairman of the Colorado River Commission, said that either late in July or early in August the commission would be reassembled and some real conclusions reached as to the best method of procedure, these conclusions to be based on the mass of facts and opinions presented to the commission.

"It appears to me that four or five different principles have been advanced for the formulation of a pact for the development of the river," Mr. Hoover stated, "and out of these we should be able to formulate some agreement. There is a sad lack of understanding of even the most fundamental engineering facts in the relation of the upper and lower basins. In time the relative weight of the rights of the several states, the relative weight of the different engineering principles involved and the relative weight of the legal process that may follow from failure to complete such a pact will all contribute to drive these states together with the national government to some solution."

Middle West Floods Do No Serious Damage to Electrical Systems

THE floods in southern Illinois and the surrounding country during the past ten days, which have damaged so much argricultural and industrial property, have not done any serious damage to central-station installations. According to reports received in Chicago on Wednesday, service has not been abandoned in any community except where limited districts have been flooded and incidental damage done to distribution lines. The crest of the flood seems to have occurred on Sunday and Monday, and central-station operators feel that the probability of serious damage is past.

Hoover to Address N. E. L. A. Convention

SECRETARY OF COMMERCE HOOVER, it was announced this week at the offices of the National Electric Light Association, has accepted the invitation to speak at the opening session of the annual convention at Atlantic City the week of May 15.

The program has been arranged tentatively as it appears on the opposite page. For public policy night a number of speakers of national importance have been invited and announcement of their names is expected shortly.

Radio-Operated Relay Gets Enthusiastic Attention at A. I. E. E. Meeting

ENGINEERING speculation was allowed free rein at the Wednesday afternoon session of the spring convention of the American Institute of Electrical Engineers in Chicago after F. W. Dunmore of the radio laboratory of the Bureau of Standards had described a relay which will operate on radio signals. It is controlled selectively from both the radio and the audio frequency standpoint, and with recording or other devices the combination can also be selectively controlled mechanically. The discussion consisted largely of questions as to the applicability of the relay and developed the possibility that it could be used for a wide variety of remote-control problems in the central-station field. The relay can be made responsive to any predetermined arrangement of signal, according to Mr. Dunmore's statement, and the discussion suggested the possibility of combining a radio transmitter and receiver and some such devices as are used in the automatic telephone field to operate oil switches or any other station or substation devices desired. None of the apparatus for such purposes is developed, but the discussion opened a wide field for research and experimental work.

In opening the convention President McClellan said that the key to industrial expansion is a condition that will make electrical power available everywhere for all industrial, agricultural, transportation and other uses. The supply must be sufficient to meet all demands of industry, and the cost must be low.

The convention continued through Thursday and Friday. Thursday afternoon was devoted to a discussion of energy from coal mines to large centers of distribution, and Friday evening to a discussion of the proposed St. Lawrence waterway. Motor and control equipment of cranes was among the subjects discussed in papers presented on these two days.

N. E. L. A. Atlantic City Convention Program

(Tentative Draft Subject to Revision)

General and Executive Sessions

TUESDAY, MAY 16, 9:30 A. M.

1—Welcome to Atlantic City, Mayor Edward L. Bader.
2—Address of President Bump.
3—Appointment of committee on president's address.
4—Report of Treasurer Abell.
5—Report of finance committee, Joseph B. McCall.
6—Report of Executive Manager Aylesworth.
7—Address of chairman Public Relations Section, Martin J. Insull.
8—Address of chairman Accounting Section, E. J. Fowler.
9—Address of chairman Commercial Section, R. H. Tillman.
10—Address of chairman Technical Section, N. A. Carle.
11—Announcements.
12—Report of committee on rate research, Alex Dow.
13—Report of committee on wiring, R. S. Hale.

WEDNESDAY, MAY 17, 9:30 A. M.

1—Report of committee on company employees' organizations, Robert B. Grove.
2—Election of nominating committee.
3—Symposium on business development: Electric light and power companies, H. L. Doherty; electrical manufacturers, G. E. Tripp; electrical jobbers, W. E. Robertson; electrical contractors and dealers, J. R. Strong; Society for Electrical Development, W. W. Freeman; N. E. L. A., H. A. Lane.
4—Announcements.
5—Address, Herbert Hoover, Secretary of Commerce.
6—Address, "Budget Control," L. F. Musil.
7—Appointment of committee on resolutions.
8—Report of committee on membership, Walter Neumuller.

THURSDAY, MAY 18, 9:30 A. M.

1—Report of insurance committee, S. E. Wolff.
2—Report of committee on relations with savings banks, M. S. Sloan.
3—Report of committee on customer ownership, John F. Gilchrist.
4—Address, Carl D. Jackson, president National Association of Railway and Utility Commissioners.
5—Announcements.
6—Address (subject and speaker to be selected).
7—Address, "Hydro-Electric Power Commission of Ontario Report," W. S. Murray.
8—Address (subject and speaker to be selected).
9—Report of committee on accident prevention, Charles B. Scott.

FRIDAY, MAY 19, 9:30 A. M.

1—Report of committee on Doherty and Billings prizes, A. S. Loizeaux.
2—Report of committee on rural lines, G. C. Neff.
3—Report of committee on water-power development, Franklin T. Griffith.
4—Report (not determined).
5—Report of lamp committee, Frank W. Smith.
6—Report of committee on electrical resources of the nation, M. S. Sloan.
7—Report of technical advisory committee, Charles F. Scott.
8—Report of committee on president's address.
9—Report of resolutions committee.
10—Report of nominating committee.
11—Election and installation of officers.

Technical Sessions

MONDAY, MAY 15, 2:30 P. M.

1—Address of chairman, N. A. Carle.
2—Report of committee on constitutional amendments.
3—Vote on constitutional amendments proposed.
4—Appointment of nominating committee.
5—Report of committee on underground systems, D. W. Roper.
6—Report of committee on safety rules, Thomas Sproule.

PARALLEL SESSION

Report of committee on hydraulic power, Markham Cheever.

TUESDAY, MAY 16, 2:15 P. M.

1—Report of nominating committee.
2—Election of officers.
3—Report of prime movers committee, H. P. Liversidge.

PARALLEL SESSION

Report of committee on inductive interference, A. E. Silver.

WEDNESDAY, MAY 17, 2:30 P. M.

Report of committee on electrical apparatus, A. H. Lawton.

THURSDAY, MAY 18, 2:30 P. M.

Report of committee on overhead systems, L. M. Klauber.

PARALLEL SESSION

1—Report of meter committee, W. L. Wadsworth.
2—Paper, "Analysis of Economic Loss Due to Power Factor—Basic Meterable Factors," R. C. Fryer, J. E. Doran and J. B. Hodium.

Public Relations Sessions

WEDNESDAY, MAY 17, 2:30 P. M.

1—Address of chairman, M. J. Insull.
2—Appointment of nominating committee.
3—Report of committee on women's public information, Olive A. Bursiel.
4—Report of committee on employee relations with the public, H. C. Blackwell.
5—Report of committee on manufacturers' advertising, H. L. Thomson.
6—Report of committee on public speaking, H. C. Couch.
7—Report of committee on relations with bankers, M. S. Sloan.
8—Report of committee on state organization of public information, H. T. Sands.
9—Report of committee on uniformity of state regulatory laws, W. W. Freeman.
10—Announcements.
11—Report of committee on upbuilding the industry, F. R. Coates.
12—Report of nominating committee.
13—Election of officers.

THURSDAY, MAY 18, 8:30 P. M.

(With music)

1—Report of public policy committee, Sidney Z. Mitchell.
2—Addresses (speakers of national prominence invited).

Accounting Sessions

TUESDAY, MAY 16, 2:30 P. M.

1—Address of chairman, E. J. Fowler.
2—Appointment of nominating committee.
3—Report of committee on accounting education, Fred R. Jenkins.
4—Report of committee on classification of accounts, reports to commissions and relations with other associations, W. J. Meyers.
5—Report of committee on budget, Harry A. Snow.

WEDNESDAY, MAY 17, 2:30 P. M.

1—Report of committee on federal income-tax procedure, F. B. Odlum.
2—Address (subject and speaker to be selected).
3—Report of committee on customers' records and billing methods, J. D. Jacobus.
4—Report of committee on accounts payable records, E. A. Davis.

THURSDAY, MAY 18, 2:30 P. M.

1—Report of nominating committee.
2—Election of officers.
3—Report of committee on fixed capital records, J. H. Lubban.
4—Report of committee on security holders' records, Robert Davey.
5—Report of committee on purchasing and storeroom accounting, W. F. Stevens.

Commercial Sessions

MONDAY, MAY 15, 2:30 P. M.

1—Address of chairman, R. H. Tillman.
2—Appointment of nominating committee.
3—Report of Electric Vehicle Bureau, C. R. Skinner, Jr.
4—Report of committee on garages and garage rates, F. F. Sampson.
5—Report of committee on transportation, F. M. Feiker.
6—Report of committee on publicity, Norman Maul.
7—Report of exhibition committee, H. T. Luscumb.
8—Paper, "Electric Trucks in the Service of the American Railway Express Company," R. F. M. Cowie.
9—General discussion on electric vehicle subjects.
10—Report of committee on commercial service and relations with customers, Harold Wright.

TUESDAY, MAY 16, 2:30 P. M.

1—Report of Lighting Sales Bureau, L. R. Wallis.
2—Report of division on educational exhibits, Clarence L. Law.
3—Report of division on residence lighting, M. Luckiesh.
4—Report of division on industrial lighting, J. Daniels.
5—Report of division on street and highway lighting, A. D. Cameron.
6—Report of division on lighting of large buildings, Arthur S. Ives.
7—Report of division on commercial aspects of lamp equipment, G. H. Stickney.
8—Report of division on sign, display and billboard lighting, P. B. Zimmerman.
9—Report of division on store lighting, W. E. Rolinson.
10—Report of lighting committee (joint committee for business development), P. B. Zimmerman.
11—General discussion on lighting subjects.
12—Address, "Lighting Education," Ward Harrison.
13—Report of committee on wiring, G. E. Miller.
14—Report of committee on wiring (joint committee for business development), A. K. Baylor.

WEDNESDAY, MAY 17, 2:30 P. M.

1—Report of Bureau on Merchandise Sales, C. E. Greenwood.
2—Report of division on central-station merchandising service, Thomas Berger.
3—Report of division on electric cooking and heating, C. O. Dunten.
4—Report of division on standardizing and testing, R. S. Hale.
5—Report of division on relations with manufacturers, F. D. Pembleton.
6—Report of committee on appliances (joint committee for business development), C. E. Greenwood.
7—General discussion on merchandising subjects.
8—Report of committee on electrically equipped furniture, Joseph F. Becker.

THURSDAY, MAY 18, 2:30 P. M.

1—Report of Power Sales Bureau, Charles K. Nichols.
2—Report of division on electric power economics, John W. Meyer.
3—Report of division on industrial heating applications, V. M. F. Tallman.
4—Report of division on material handling, R. H. McLain.
5—General discussion on power subjects.
6—Report of committee on education, Fred R. Jenkins.
7—Report of committee on "Electrical Salesman's Handbook," George H. Jones.
8—Report of nominating committee.
9—Election of officers.

Indiana Company Starts Building First of Chain of Water-Power Plants

AWARDING of a general contract for construction of a hydro-electric power plant of 8,500 hp. rating at Norway, White County, Ind., the first unit of a proposed five-million-dollar project of the Indiana Hydro-Electric Power Company, was announced recently by Harry Reid, vice-president of the company. The plant is to be in operation by the end of the year, Mr. Reid said. The company, which is a Middle West utilities property, plans the development of three other power sites, at Tioga, Oakdale and Springboro. The ultimate development will be 29,000 hp.

The hydro-electric developments will be operated by the Interstate Public Service Company, which has large electric light and power and electric railway properties in Indiana, and it, with the Central Illinois Public Service Company, which serves 190 Illinois communities with electric light and power, has entered into a contract for the purchase of the entire electrical output.

New Oklahoma Plant to Be Center of Large Distributing System

THE Oklahoma General Power Company has completed plans for the construction of a two-million-dollar steam station on the Arkansas River near Fort Gibson. Although the details of this plant have not been given out, it was announced that automatic control of all units would be the fundamental idea of construction. This company was recently incorporated as a subsidiary of the Oklahoma Gas & Electric Company.

This 15,000-kw. plant will be constructed by H. M. Byllesby & Company. Realizing that natural gas may not be available a few years hence, coal will be used for fuel. It was with this view in mind that the plant was built in close proximity to the coal mines of eastern Oklahoma. J. F. Owens, vice-president and general manager of the parent company, said that it would be the center of an anticipated large electrical distributing system over the entire eastern half of the state. The program calls for the building of high-tension lines to various cities in Oklahoma. One of these will be a 60-mile, 63,000-volt transmission line to Fort Smith, Ark.

Two New Units for Calumet Plant of Commonwealth System

THE 1922 electrical construction program for the Commonwealth Edison Company, which includes the addition of two generating units at the new Calumet station as well as four new substations, will require an expenditure of $14,000,000. Contracts have been let for the two 30,000-kw. units and the necessary increase in building space. Work has already started on driving a 6-ft. tunnel under the river. This tunnel will be 340 ft. long and will carry the 33,000-volt cables into the Indiana territory, thereby adding another link to the Mississippi Valley superpower system. Two additional cables will be laid to connect the Fisk and Quarry Streets stations with the Calumet station. This will double the lines now connecting the two stations.

Of the four new substations to be built this year, two will serve the "Loop" district. One rotary-converter station, rated at 4,000 kw., will be built on LaSalle Street between Polk and Harrison Streets. A second station is to contain a rotary converter and storage batteries with a total capacity of 8,000 kw. This station will be on Adams Street between Des Plaines and Halsted Streets. The other substations, rated at 6,000 kw., are to be placed at Prairie Avenue and Armitage Avenue, outside the "Loop."

In order to improve the radio broadcasting service, two 125-ft. steel towers will be erected on the roof of the Edison Building. Since this building is 290 ft. high, the aërial will be 415 ft. above the pavement.

Davis Bridge Seven-Million-Dollar Power Development Progressing

EXCELLENT headway is being made by the New England Power Company upon the hydro-electric development on the Deerfield River at Davis Bridge, Vt., which has been under construction for several months. It is estimated that this development will add 105,000,000 kw.-hr. to the output of the system and will also directly increase the output of all the company's generating plants on the river. The work at Davis Bridge will include a reservoir about 12 miles long with an average width of one-third mile; an earth-filled dam 1,200 ft. long and 200 ft. high, impounding 45,000,000,000 gal. of water, and 18,000 kva. in generating machinery. The diversion tunnel required by the hydraulic layout is about one-third completed. The machinery has not yet been purchased, nor has a final decision been reached as to the head to be adopted. It is probable that about two years will be required to complete this development, the estimated cost of which is $7,000,000.

New Orleans Company and City Officials Reach Agreement

THE representatives of the security holders of the New Orleans Railway & Light Company have compromised their differences with the Commission Council of the city, and on April 8 the Council gave its approval to the settlement reached, Mayor McShane alone dissenting. This agreement provides for carrying out every point in that of last fall, which was held up by court order, except the provision about the rate of return on new money needed for improvements and extensions. This provision was waived at the solicitation of the 4½ per cent security holders, and with the obstacle out of the way the conferees lost no time in reaching an agreement. The rate of return on both new and old money (the valuation being fixed at $44,700,000) is now 7½ per cent.

Commissioner Paul Maloney of the Department of Public Utilities, summarizing some of the advantages which will accrue to New Orleans as the result of the compromise, mentioned these among others: Local control is assured; securities cannot be sold without the approval of the Commission Council, which is to have access to the books and supervise the operations of the company; real estate owned by the company and not needed is to be sold and the proceeds put into equipment; the city is to have a perpetual option to purchase the properties, one-half of a reserve fund of $300,000, set up yearly, to be reinvested in the property and the other half in liquidating the bonds; all dividends in common

stock at the time of reorganization are to be reinvested in the property; no stock dividends are to be declared, and the rate of cash dividends is to be limited, as is the return.

Time must still elapse before reorganization can be effected, while the necessary court procedure is being followed, but the first step, the filing of a bill of foreclosure, will probably be taken before the end of April.

Supreme Court Refuses to Review Utah Rate Case

THE Supreme Court by refusing to review the decision of a lower court has affirmed the decision sustaining electric rates prescribed by the Public Utilities Commission of Utah. These rates were complained of by the Ogden Portland Cement Company, the Union Portland Cement Company and the Utah-Idaho Central Railroad on the ground that they abrogate previous contracts with the power companies and are in excess of the old rates.

Dayton Power & Light $4,750,000 Expansion Program Under Way

GROUND has already been broken by the Dayton Power & Light Company for an addition to its Miller's Ford station, doubling its capacity. The total amount of the improvements is to be approximately $2,000,000. This is a part of the expansion program, involving a total expenditure of $4,750,000, which has been mapped out for the next five years.

San Joaquin Light & Power Gets License for 266,000 Hp. Development

THE San Joaquin Light & Power Corporation, Fresno, Cal., has been granted a license by the Federal Power Commission for the term of fifty years for a hydro-electric power development on the north and west forks of Kings River in California, which will involve an estimated expenditure of $51,000,000 and have an ultimate installed capacity of 266,000 hp. Work is to begin on the first plant next month, and if the present rate of growth in power consumption in the vicinity of the project continues, it will be necessary to make the total capacity available by 1930.

The project will occupy about 14,000 acres of land in the Sierra and Sequoia National Forests. The developed power will be fed into the company's present transmission system through its substation at Sanger by means of a 110,000-volt transmission line to be built in two parallels, one of which will carry a single three-phase circuit on wood poles and the other two three-phase circuits on steel towers.

The project will consist of three storage reservoirs to provide a combined storage capacity of 204,000 acre-feet, eight diversion dams and seven power houses, of which two will be built into storage dams and will operate under variable heads, the maximum being 175 ft. and 245 ft. respectively. Three others will operate under heads of 365, 1,420 and 1,430 ft. respectively. Two power houses will operate under heads of 2,350 ft. and 2,380 ft. and will be among the very few plants in the United States operating under heads exceeding 2,000 ft.

The entire development is covered by the license, but its provisions as to storage do not become effective until the corporation shall obtain from the California Department of Public Works the right to store water for power purposes. It now has the right to use the natural flow of the streams on which its diversion dams are to be built, except of Rancheria and Bear Creeks, tributaries respectively of the north and west forks of Kings River.

The main construction program is divided into five parts, as follows, for each of which the time of commencement and completion has been fixed subject to later modification with the approval of the commission:

1. Balch Development No. 1.—This will consist of Balch diversion dam No. 1, Balch tunnel with capacity of 500 second feet, penstocks, Balch power house with an initial installation of 31,000 kw. and provision for future increase to 93,000 kw., and transmission line from the power house to the main transmission system at Sanger substation. Work is to begin in May, 1922, and be completed by June 1924.

2. Haas Plant.—This will consist of diversion dam, Haas tunnel with capacity of 500 second-feet, penstocks, Haas power house with an initial installation of 31,000 kw. and provision for future increase to 62,000 kw., and transmission line to the Balch plant. Work will begin in April, 1924, and be completed by June, 1926.

3. Kings River Plant.—This will consist of diversion dam, Kings River tunnel with capacity of 750 second-feet, penstocks, and Kings River power house with an installed capacity of 7,500 kw. and provision for future increase to 15,000 kw. Work will begin in January, 1926, and be completed by June, 1927.

4. Balch Development No. 2.—This will consist of Balch diversion dam No. 2, Balch tunnel No. 2 with capacity of 250 second-feet, and an additional 15,500 kw. unit in Balch power house. Work will begin in April, 1926, and be completed by June, 1928.

5. Farnham and Meyer Plants.—The Farnham plant will consist of Farnham diversion dams Nos. 1 and 2, penstocks, and power house having initial installation of 8,300 kw. and provision for future increase to 16,600 kw. The Meyer plant will comprise tunnel, penstocks, power house with an initial installation of 2,300 kw. and provision for future increase to 8,300 kw., and transmission line to Balch power house. Work will begin in April, 1927, and be completed by June, 1929.

Construction of the remainder of the project will be undertaken when market demands have grown to the extent which will warrant installation of additional capacity, and will comprise Wishon dam, reservoirs and power plant; Meyer dam and reservoir; Peart dam, reservoir and power plant; Rancheria Creek diversion dam and tunnel, and Bear Creek diversion dam and canal.

Heavy Power Demand Awaiting Muscle Shoals Development

TESTIMONY by Thomas W. Martin, president of the Alabama Power Company, in behalf of that company's Muscle Shoals offer was the principal event of the week in connection with the Congressional investigations now going on for disposal of that project. One of the high points of Mr. Martin's testimony was his attitude toward any final proposal his company might make. This was expressed in response to questions by Senator Kendrick as to whether the power company might be willing to eliminate from its offer the Sheffield steam plant, which Senator Kendrick thought under some circumstances the government ought to continue to own even though it also continued

to lease it, as it is now leased, to the Alabama Power Company or to others. Mr. Martin testified that in presenting the power company's proposal it was assumed that it was in line with what might be the policy of the government. Senator Kendrick said: "My idea of negotiation is one in which each party involved has a right to change his mind and insist upon having conditions met." Mr. Martin replied: "If the government decides upon a policy, I have no doubt a different proposition can be worked out. We had no specifications on what Congress would lay down as its policy, in suggesting a plan which in no sense was intended to be final and irrevocable."

Mr. Martin expressed the conviction that by the time Dam No. 2 could be completed the market demands for power in the territory adjacent to Muscle Shoals would justify a public utility company in proceeding with the development at Dam No. 3 under a license from the Federal Power Commission. He told the committee that "there are certain demands for power in the localities which would be reached from Muscle Shoals, running as high as 25,000 hp. to 30,000 hp., which must be met within a reasonable time." He added: "I have in mind one large community. The operators of the utilities of that community are going ahead—must go ahead to meet the required needs—to build a new steam plant unless the Muscle Shoals source of power is made available within some reasonable time, and such operations as that are involved in this whole big problem."

FORD MUST ALTER PROPOSAL

While Mr. Martin and others were testifying before the Senate committee on agriculture and forestry, the "informal conversations" which were reported in the ELECTRICAL WORLD last week between members of the House military affairs committee were continued. These conversations have not reached a point, as this is telegraphed from Washington, which would warrant a forecast as to the report of the House committee beyond a continued belief by a majority of members of the committee that Henry Ford's offer to purchase the Muscle Shoals projects cannot be reported out of the committee favorably unless Mr. Ford consents to increase his offer and make in it alterations of the most far-reaching importance to him and to the government. Just what increases and alterations in his offer Mr. Ford may make, if any, are being withheld from public view in Washington, although W. B. Mayo, Mr. Ford's chief engineer and personal representative, remains at the capital, waiting to be called by either committee of Congress.

HEARING ON ENGSTRUM OFFER

After the hearings in behalf of the acceptance of the Alabama Power Company's offer before the Senate committee, that committee began to hear former Senator Marion Butler of South Carolina and Frederick E. Engstrum in behalf of the Engstrum offer to construct at government expense. The committee will later reach a hearing on the Ford offer. Both committees of Congress express a wish to hear Mr. Ford personally, but doubt is expressed whether he will consent to appear for examination by the committees.

Later on in the Senate hearings it is the intention to hear President Martin of the power company and Hubert S. Dent of counsel for the power company in connection with the legal phases of the contract the power company has to purchase the government's interest in the Gorgas plant of the company, which Mr. Ford desires to buy. It is also the intention of the Senate committee to hear representatives of the Air Nitrates Corporation, which has a contract to purchase Nitrate Plant No. 2, which Mr. Ford also desires to buy.

In addition the Senate committee wishes to hear William H. Onken, Jr., editor of the ELECTRICAL WORLD, as well as the presidents of the national technical and engineering societies, who have been invited to appear at their own convenience. When hearings on the present offers are concluded, other hearings will be held on Senator Norris' own bill for government ownership and operation under a federal corporation.

Stay of Injunction Asked in Langmuir Lamp Patent Case

ATTENTION has been drawn to the item on page 699 of the April 8 issue of the ELECTRICAL WORLD stating that the Continental Lamp Works, Inc., and the United Lamp Manufacturers' Corporation have been enjoined by the United States Circuit Court of Appeals on petition of the General Electric Company, pending settlement of litigation, from manufacturing vacuum tungsten and gas-filled lamps covered by the Just and Hanaman and Langmuir patents. As a matter of fact, the Court of Appeals did not grant an injunction, but reversed the decision of the lower court denying the injunction and ordered the lower court to grant the injunction.

Counsel for the Continental Lamp Works on Wednesday applied to the lower court, on permission of the Court of Appeals, for a stay of issuance of the injunction on the ground that to issue it would enable the General Electric Company to carry out an unlawful monopolistic plan.

Only the Langmuir patent for a gas-filled incandescent lamp is involved.

Water-Power Permit Applications

THE Smith-Sanders Power Company of Rogersville, Tenn., has applied to the Federal Power Commission for a preliminary permit covering a power project in the Holston River in Hawkins County, Tenn. The estimated primary power which will be developed is 15,000 hp., but it is the intention to install equipment sufficient to generate 25,000 hp. The power is to be used for public utility purposes.

The Southern California Edison Company has applied for a license covering that part of the Kaweah River project which is outside the boundaries of the Sequoia National Park, in Tulare County, Cal.

The Mineral County Light & Power Lines of Hawthorne, Nev., have applied for a license to cover 52 miles of transmission line.

The Willow Creek Mines of Seattle, Wash., have applied for a preliminary permit covering a 650-hp. mining project on Craigie Creek in Alaska.

Thebo, Starr & Anderton, Inc., of San Francisco, have applied for a preliminary permit covering a power development on McCloud and Pit Rivers in Shasta County, Cal. The power is intended for public utility use.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest

Southern Power Building Another Transmission Line. — The Southern Power Company is stringing an additional power line on steel towers from Great Falls, in Chester County, S. C., to Newberry, S. C., via the Monticello section of Fairfield County. This additional line will reinforce one running to Newberry by another route. It will be about 60 miles in length and will cost about $8,000 a mile.

A New Italian Paper in Electrical Field.—A well-illustrated journal, *Sincronizzando*, has been started by the Società Idroelettrica Piemonte of Turin, Italy, and associated companies for the purpose both of promoting good will among employees and publishing articles of general electrical interest. This excellently arranged house organ is, it announces, the first and so far the only one of its kind in Italy.

Purdue Holds Electric Metermen's School.—The second annual school for electric metermen held at Purdue University began on April 10 and continued until April 14. This school was held under the direction of C. F. Harding, head of the electrical engineering department, and the Indiana Electric Light Association in co-operation with the Public Service Commission and electric meter companies. The course consisted of a series of lectures, demonstrations, tests and discussions on various types of meters.

Reduced Rates Offered at Winona, Ind.—The Middle West Utility Company, which recently bought the property of the Winona Electric Light & Water Company at Warsaw, Ind., has proposed a new schedule of rates for street lighting there which provides for a 25 per cent reduction. The rate for 250-cp. lamps would be reduced from $70 a year to $52.50 and the rate for 60-cp. lamps from $40 to $30 a year. The company also has offered a slight reduction on energy for power and asks that a petition for lower rates now before the Public Service Commission be dismissed.

The Term "Luminaire" Wins Approval of I. E. S.—The council of the Illuminating Engineering Society has formally approved the report of the society's committee on nomenclature and standards recommending the adoption from the French of the word "luminaire" to denote what has sometimes been infelicitously called a "movable fixture"—that is, an appliance which can be moved from place to place. "Luminaire" was preferred by the committee to any of the coined words suggested, and other electrical bodies have indorsed its adoption.

Richmond (Ind.) Municipal Plant Seeks to Have Commission Fix Its Rates.—The city of Richmond, Ind., through its Board of Public Works, will ask the Indiana Public Service Commission to make an inventory of the municipal electric light and power plant and arrive at a valuation, based on present equipment, for rate-making purposes. The plant underwent many changes last year and was the target for criticism because of alleged mismanagement. The present city officers believe that an inventory should be taken and have decided that the commission should supervise the work rather than have the city employ experts for the purpose.

Two-Way Telephony Between Ship and Shore.—The first actual conversation by telephone between a person on a moving ship and another on shore took place last month when President Thayer of the American Telephone & Telegraph Company and the captain of the United States line steamship America exchanged greetings. Mr. Thayer was at his home in New Canaan, Conn., and the steamship was 370 miles from Ambrose Lightship, with twenty-four hours still to elapse before it could dock at New York, nearly 400 miles away. The conversation was transmitted by the ordinary two-wire system between New Canaan and the operating rooms in New York, by the four-wire system to the New Jersey coast, and thence to the ship by radio. Two land stations were used, Deal Beach for transmitting and Elberon for receiving. The success of the experiment prefigures the time when those crossing the ocean will be within telephonic reach of land during the entire passage.

San Joaquin Corporation to Install New Unit to Supply Southern Edison.—The California Railroad Commission has approved an agreement whereby the San Joaquin Light & Power Corporation will install in its Midway steam plant, at a cost of $1,200,000, a 12,500-kw. unit to furnish power to the Southern California Edison Company. The San Joaquin further has agreed to develop, if possible, an additional 7,500 kw. capacity on its system or to obtain it through purchase, making a total addition of 20,000 kw. According to the term of the contract, the San Joaquin will sell to the Edison company 80,000,000 kw. from Aug. 1, 1922, to June 1, 1923, at a price of $42,485 per month, plus 3½ mills per kilowatt-hour. The commission points out that under the agreement the Edison company will benefit by reason of the cheap gas supply available as fuel at the Midway plant and will save additional investment in steam plants pending the bringing in of new hydro-electric power. At the expiration of the agreement the San Joaquin company expects to need the additional plant capacity for its own growing business.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month

Florida Engineering Society. — This society is to hold its annual meeting at Daytona, Fla., on May 15 and 16.

American Society for Testing Materials.—Atlantic City, N. J., will be the place and the week from June 26 to July 1 the time for holding the annual meeting of this society.

Iowa Section, N. E. L. A.—The annual meeting of the above section will be held at the Inn Hotel, Lake Okoboji, Iowa, June 20, 21 and 22, and the annual meeting of the Iowa Electric Railway Association at the same place on June 23. An interesting program, with business sessions in the mornings and entertainment in the afternoons, is being arranged.

New York Electrical Society.—The New York Electrical Society will celebrate its four hundredth meeting on Wednesday, April 26, by a visit to the new Hell Gate plant of the United Electric Light & Power Company, when Frank W. Smith, vice-president of that company, will give an address on "Thirty Years of Alternating-Current Service in New York City."

Coming Meetings of Electrical and Other Technical Societies

A. I. and S. E. E. Section Meetings—Pittsburgh, April 22; Philadelphia, May 6; Chicago, May 8; Cleveland, May 8.

A. I. E. E. Section Meetings — Toronto, April 24; Atlanta, April 27; Utah, April 28; Vancouver, B. C., May 5.

American Welding Society — New York, April 26-29. (For program see issue of April 15, page 750.)

American Electrochemical Society—Baltimore, April 27-29.

Missouri Association of Public Utilities — Columbia, Mo., May 4-6.

A. S. M. E. Spring Meeting—Atlanta, May 8-11. (For program see issue of April 15, page 750.)

Florida Engineering Society — Daytona, Fla., May 15-16.

N. E. L. A. Annual Convention—Atlantic City, May 15-19. (For program see "News of the Industry.")

National Electrical Credit Association—Detroit, May 18-19.

Electrical Supply Jobbers' Association — Hot Springs, Va., May 24-26.

N. E. L. A. Geographic Divisions—Southwestern, San Antonio, May 3-6; Pacific Coast, Los Angeles, May 31-June 3; Northwestern, Boise, June 7-10; North Central, St. Paul, June 13-15; Iowa Section, Lake Okoboji, June 20-22.

Electric Power Club — Hot Springs, Va., June 5-7.

Canadian Electrical Association — Ottawa, Ont., June 15-17.

Associated Manufacturers of Electrical Supplies—Spring Lake Beach, N. J., June 19-25.

American Physical Society, Pacific Coast Section—Salt Lake City, June 22-24.

A. I. E. E. Annual Convention—Niagara Falls, Ontario, June 26-30.

American Society for Testing Materials—Atlantic City, N. J., June 26-July 1.

Ohio Electric Light Association — Cedar Point, Ohio, July 11-14.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Commission Lacks Jurisdiction to Compel Public Utility to Pay Debts.—In Ashley vs. Railroad Commission, the Supreme Court of California sustained the commission in holding that that body lacked jurisdiction of a proceeding to compel a canal company supplying water for irrigation to repay money borrowed to construct its plant. (204 Pac. 825.)*

Courts Should Be Slow to Interfere with Discretion of Commission.—The Public Service Commission of Washington State, now organized as the Department of Public Works, is invested by the statute with broad powers, and the courts should be slow to interfere with its discretion. This expression of policy was made by the Supreme Court of Washington in Public Service Commission vs. State. involving railroad log-hauling rates, (204 Pac. 791.)

When Punitive Damages May Be Allowed.—Reversing a verdict for the plaintiff in Beeler vs. Green River Light & Water Company, an action for damages because of injuries received from the explosion of a defective boiler, the Court of Appeals of Kentucky declared that punitive damages are not authorized and should never be allowed in any case unless the evidence tends to show that the defendant acted maliciously, willfully, or with such gross negligence as to indicate a wanton disregard of the rights of others. (237 S. W. 1.)

Damages Allowed Against Electric Companies for Destruction of Grain.—An appeal from the decision of the District Court in Fabry vs. San Joaquin Light & Power Corporation and in Vanderburgh vs. Same (see ELECTRICAL WORLD, Feb. 4, 1922, p. 251; also for cognate case, issue of Aug. 7, 1920, p. 304) has been heard by the California Supreme Court. In these cases heavy damages were awarded to farmers for the destruction of grain from a fire alleged to have been started when employees of the defendant company were engaged in repairing a power line. The Supreme Court sustained the verdict, finding that the evidence was sufficient to show that the repairmen were negligent in failing to prevent or extinguish a grass fire started by sparks from their fire pot and that testimony to the effect that when their attention was called to the fire, then just starting, one of them said, "Never mind, partner, we will attend to the fire," was admissible as tending to establish defendant's responsibility. (204 Pac. 558.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Waiver of Valuation Proceedings No Ground for Reversing Commission's Order.—Although valuation of a public utility's property is an essential in fixing rates, if the utility and the complainant expressly waive this requirement, with the consent of the commission, then the Supreme Court of Ohio found, in a gas-rate case (City of Lima vs. Commission), if the net return is found below what is just and reasonable upon a valuation conceded by the complainant, no prejudicial error arises which demands a reversal of the commission's order. (134 N. E. 453.)

Powers of Indiana Commission.—In reversing a certain order of the Indiana Public Service Commission affecting the New York Central Railroad, which brought suit against the commission to have the order set aside, the Supreme Court of Indiana pointed out that the duties of the commission are prescribed by statute, the manner of the exercise of the power prescribed being the measure of the power given, and when it receives authority to do a certain thing the duty is imposed upon it by statute to do it and it has no authority to delegate the power to any one else, as had been done in the case under review. (134 N. E. 282.)

Validity of Commission Order Where Commissioners Were Succeeded by Others After Testimony and Before Order.—The Supreme Court of Arkansas has found, in the Van Buren Waterworks vs. City of Van Buren, that in proceedings before the Corporation Commission for increase of rates the fact that the testimony was adduced prior to the appointment of two new commissioners, who were members of the commission at the time the final order was made, did not invalidate the proceedings so as to require the Circuit Court to reverse the ruling of the commission, since the court hears the cause *de novo* and not merely for the purpose of reviewing the proceedings before the commission for error. (237 S. W. 696.)

In Action for Damages Against Two Companies Jointly, Details of Company Agreement Need Not Be Proved.—It was not incumbent upon the plaintiff, the Kansas City Court of Appeals held in Adams vs. Moberly Light & Power Company and Citizens' Electric Light Company, to prove the details of the agreement between the two companies in order to recover damages in a suit brought against them jointly; it was enough to show that they operated together to furnish electricity to their customers. In this case a boy of eleven was killed by contact with a broken high-tension wire, and the appellate court sustained a verdict awarding $5,000 damages to his parents, holding that the amount was not excessive and that the jury was the judge of the facts as to the negligence of the companies and the contributory negligence of the victim. The appellate court refused to attach importance to the testimony of expert witnesses to the effect that insulation gives little protection from a charged wire. (237 S. W. 162.)

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Cost of Selling Securities.—The Wisconsin Railroad Commission in excluding from operating expenses the cost of selling securities of the Wisconsin Telephone Company said: "In technical commercial accounting there might be reason for treating this cost as an operating expense if incurred in connection with the sale of stock rather than the sale of bonds. However, if the company sells securities directly rather than through a banking house, its selling cost takes the place of the discount or commission ordinarily given to the banking house for handling the securities. In the case of a bond issue or any debt issue with definite term costs of this nature are considered by the commission as part of the interest on the issue and are amortized over the life of the securities. In the case of a stock issue with no definite term the amortization period, of course, cannot be based upon the life of the securities, but we think the principle still holds that expenses of this character constitute a part of the return."

Determination of Connected Power Load.—In a case involving the Central Illinois Light Company recently heard by the Illinois Commerce Commission the consumers concerned, who had installed motor-generator sets to convert the three phase, 60-cycle alternating current supplied by the company to direct current, contended that by interposing the motor-generating sets between the source of supply and the ultimate use they had limited the possible demand on the company's system to the capacity of the motor of the motor-generator set. The utility, on the other hand, maintained that in calculating active load the percentages should be applied to the total rating in kilowatts of the motors used by the consumers. The commission pointed out that in the case of some of the complainants, who had installed motor-generators of a greater capacity than that of the motors connected to them, the application of the company's rule resulted in a decrease of the bill. The evidence showed that motors can continue to be connected to a motor-generator set in use until the capacity of motors connected is approximately twice the capacity of the motor-generator set. To permit an application of rate schedules which would allow one consumer to be billed one-half of the amount which another consumer would pay with the same work to perform and the same size installation of motors with which to perform it would unquestionably be a discrimination.

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

Clare N. Stannard has been elected vice-president and general manager of the Denver Gas & Electric Light Company. Mr. Stannard comes to this new position after twenty-four years of experience in the organization and operation of public utilities. He was born in New York State in 1870. At

C. N. STANNARD

the age of twenty-one years he entered the service of the gas and electric company of Binghamton, N. Y., and after eight years with various gas, electric and street railways entered the employ of the Denver Consolidated Electric Company, the forerunner of the present company. Until the appointment just made Mr. Stannard was secretary of the Denver Gas & Electric Light Company and also of the Summit County (Col.) Power Company of Colorado. He is an active member of the Denver Civic and Commercial Association and is also treasurer of the Denver Tourist Bureau. He is a past-president of the Denver Rotary Club and was a delegate to the international convention of that organization in Edinburgh, Scotland, last summer. He is a member of several Denver clubs and of national technical and professional organizations.

John R. Marsh has been appointed assistant manager of the public relations department of the Georgia Railway & Power Company. Mr. Marsh succeeds Paul Warwick, who recently resigned to become executive secretary of the Georgia Committee on Public Utility Information.

Prof. Dugald C. Jackson, head of the department of electrical engineering, Massachusetts Institute of Technology, and senior member of the firm of Jackson & Moreland, consulting engineers, Boston, was unanimously elected president of the Boston Society of Civil Engineers at the annual meeting of the society March 15.

G. M. Miller, superintendent of electric distribution for the Louisville Gas & Electric Company, has been elected president of the Electric Club of Louisville.

H. D. Miller has been appointed manager of the new-business department of the Western States Gas & Electric Company, Stockton, Cal. Mr. Miller has been with this company for several years in various capacities.

Henry Tideman, who has opened an office at 33 South Clinton Street, Chicago, as an electrical and mechanical consulting engineer, brings to this undertaking years of experience acquired as a manufacturer and engineer. After attending the Universities of Heidelberg and Berlin, Mr. Tideman entered the Polytechnic Mitweida of Saxony and was graduated as an electrical-mechanical engineer. Soon after this he came to America and founded the Menominee Electric Company at Menominee, Mich., becoming its president. When this company was reorganized in 1919 at Cairo, Ill., Mr. Tideman headed the new company, which carried his name until his resignation in October, 1921.

Fred W. Insull was elected president of the Oklahoma Utilities Association at its recent meeting in Oklahoma City. Mr. Insull is president of the Public Service Company of Oklahoma and the Chickasha Gas & Electric Company. He was born in 1875 and started in the electric light and power business in Winnipeg, Canada, in 1891. In 1902 he was appointed secretary and treasurer of the North Shore Electric Company, with offices in Chicago, this company being the predecessor of the present Public Service Company of Northern Illinois. He continued in this position until March, 1909, when he went West and was associated with H. M. Byllesby & Company as auditor for their properties on the Pacific Coast, later moving to Pueblo, Col., as auditor for the Arkansas Valley Railroad, Light & Power Company. In January, 1913, Mr. Insull went to Oklahoma for the Middle West Utilities Company to take charge of the properties now consisting of the Public Service Company of Oklahoma and the Chickasha Gas & Electric Company. Mr. Insull is a member of several technical organizations and has been closely identified with many associations and clubs of local importance.

William H. McInnis has been appointed commercial manager of the Keokuk Electric Company, succeeding Iner Carlson. Mr. McInnis was formerly with the Reno (Nev.) properties of the Stone & Webster Company.

Rufus E. Lee has been elected president of the Continental Gas & Electric Corporation, Cleveland. Mr. Lee assumes his new position after many years of organizing and operating public utility plants. He was for many years general manager and secretary and treasurer of the Lee Light & Power Company of Clarinda, Iowa. In 1917 he resigned from this company to operate as owner the Hubbard Ice & Coal Company of Cedar Rapids, Iowa. Along with that business he also acted

R. E. LEE

as receiver for the Nebraska Electric Company, which formerly owned and operated several properties in Nebraska. In November, 1919, he again became interested in the Lee Light & Power Company, and he has since reorganized and put this property on a paying basis. The Continental Gas & Electric Corporation, of which Mr. Lee has been elected president, owns and operates more than one hundred plants, and negotiations are now pending for the purchase outright of other valuable plants in its territory. Mr. Lee is a past-president of the Iowa Electrical Association.

W. I. Whitefield has resigned as assistant superintendent of the lighting and power department of the Roanoke (Va.) Railway & Electric Company, and has become associated with the Charles M. Kelso Company, engineers and contractors. He will be stationed at Utica, N. Y.

J. P. Pulliam, in charge of the operation of the properties of the Wisconsin Securities Company, has been elected president of the Wisconsin Utilities Association, which is a new organization including the former Wisconsin Gas Association and the Wisconsin Electric Association. Mr. Pulliam was president of the Wisconsin Electric Association the past year.

R. H. McLain has accepted the position of sales manager of the Maine Electric Company, Portland, Me. Mr. McLain has been with the General Electric Company at the Schenectady works for a number of years.

J. L. Fellows, the new president of the American Washing Machine Manufacturers' Association, is the secretary and treasurer of the Grinnell Washing Machine Company. After graduation from Grinnell College in 1901 Mr. Fellows went to Sherwood, N. D., and

J. L. FELLOWS

took charge of the lumber yard of the F. H. Stoltz Lumber Company. He remained there until 1907 and then returned to Grinnell, where he purchased a partnership in the Carney Lumber Company. During the next year Mr. Fellows became interested in the washing-machine industry, and he finally organized the Thompson Brothers Company, which was later called the Grinnell Washing Machine Company. In the summer of 1908 the company produced one of the early electrically driven washing machines with a power-driven wringer. In 1909 he sold his interest in the Carney lumber yard and devoted his entire attention to problems of patent rights affecting his company. In addition to his duties as secretary and treasurer Mr. Fellows has been actively connected with the sales work of his company.

F. L. Bunker is now connected with the Southern Radio Corporation, Charlotte, N. C., as commercial engineer. He was previously with the Westinghouse Electric & Manufacturing Company at Charlotte.

H. A. Vernon is the recently appointed sales manager of the Art Lamp Manufacturing Company, Chicago. After graduation from the University of Illinois in 1908, Mr. Vernon became associated with Sears, Roebuck & Company and in 1912 went with the Alcazar Range & Heater Company, Milwaukee, as assistant advertising manager, remaining there until 1916. Until recently he was advertising manager of the Wahl Eversharp Company.

Ernest N. Calhoun, formerly connected with the Cutler-Hammer Manufacturing Company as sales engineer, has been appointed sales manager of the electrical heating department of the Edwin L. Wiegand Company, Pittsburgh.

F. W. Stolley, district manager for the last five years for the Willcox & Gibbs Sewing Machine Company, is now taking an active interest in the American Metal Moulding Company, Newark, N. J., as vice-president and sales manager.

P. L. Goddard has been appointed executive secretary of the Rocky Mountain Electrical Co-operative League to succeed Charles H. Talmage, who has resigned. Mr. Goddard has been connected in the past with the Utah Power & Light Company and the Hawaiian Electric Company as purchasing and sales engineer.

Paul C. Sorsby has been appointed turbine and generator expert for the International General Electric Company, with headquarters at Yokohama, Japan. Mr. Sorsby is a technical graduate and has had fourteen years of engineering experience, including twelve years with the General Electric Company. He sailed from San Francisco for Japan the latter part of March.

C. H. McCullough, connected for many years with the Pittsburgh district office of the Westinghouse Electric & Manufacturing Company, has resigned to organize the C. H. McCullough Engineering Company with offices in the Oliver Building, Pittsburgh. The company represents among others the Post-Glover Electric Company and Van Dorn & Hutton.

G. E. Lewis is president of the newly formed Wisconsin Electric Appliance Company, electrical jobber, Menasha, Wis. Mr. Lewis received his electrical training with the Allis-Chalmers Company, with which he was connected from 1904 to 1910. He spent the years from 1910 to 1917 with the S. F. Bowser Company, Fort Wayne, Ind., and left there at the end of that period to organize the Twin Cities Supply Company at Menasha.

H. S. Killelea has severed his connection with the New England Power Company to enter business for himself in Brattleboro, Vt., where he has organized a repair and contracting company and in addition will act as a consulting electrical engineer. Mr. Killelea has been with the New England Power Company for the past three years as superintendent of electrical construction, with headquarters at Worcester, Mass. For the past two years he has maintained field headquarters in Brattleboro, handling several large hydroelectric construction projects near there. After graduation from an engineering school Mr. Killelea entered the service of the General Electric Company and later was connected with the Turners Falls Power & Electric Company as construction superintendent.

H. C. Budd, has resigned his position with the Canadian General Electric Company and has joined the sales staff of the Moloney Electric Company of Canada, Ltd. He will have his headquarters in the York Building, Toronto.

Russell S. Gibson, formerly chief electrician of the Eastman Kodak Company, is now with the Ajax Battery Company, Rochester, N. Y.

O. A. Lawrie has recently been appointed district sales manager for the Ohio Brass Company, Mansfield, Ohio.

O. A. LAWRIE

Mr. Lawrie's appointment takes effect at once. He is to have his headquarters in Boston. For the past sixteen years Mr. Lawrie has been connected with the American Copper Products Corporation in various positions.

John D. Goodliff, who has been connected with the Northwestern Electric Equipment Company, New York, for the past ten years, has accepted the position of sales manager with the Parr Electric Company, Inc.. New York.

Obituary

Walter Ferguson died at his home at Stamford, Conn., on April 7, after a long illness. Mr. Ferguson was born in Stamford in 1842 and was graduated from Trinity College. He was one of the organizers of the Brooklyn Edison Company and founder of the Kings County Electric Light Company, which eventually was obsorbed by the Brooklyn Edison Company. He was also active in the establishment of the Union Carbide Company, of which he was a director, and at one time was a director of the People's Gas Light Company of Chicago and of several railroad companies. At the time of his death Mr. Ferguson was president of the Stamford Trust Company, a director of the First Stamford National Bank and chairman of the board of directors of the Stamford Gas & Electric Company.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Gain Reported in Industrial Lighting Installations Since Jan. 1

A CONSIDERABLE gain in lighting installations for industrial plants has been noticed in the last three months by several representative manufacturers of fixtures. This is welcome business, but it is discounted somewhat as an indication of a revival of general business for the reason that many of these installations have been worked on for as long as six or eight months, specifications having been prepared and the projects having reached the point where bookings naturally follow. Some of the plants in which the systems are being installed are partially shut down, while others are working close to capacity, so that an increase in lighting-fixture business is not an accurate index of industrial prosperity.

The installations have been well scattered through the manufacturing world, and it is becoming increasingly easy to convince factory managers of the advantages of a high standard of illumination. Textile mills have been particularly good buyers of "more light," the metal industry has also shown much interest, and floodlighting has been another lucrative field.

The large manufacturing companies are finding that the expense of a large engineering department for the purpose of drawing up specifications and advising clients is well repaid, not only by securing the original installations, but by laying the foundation for obtaining other electrical business from the customer at a later date. How successful the engineering service is in securing the initial order after inquiry may be seen from the fact that plans prepared by one company are turned down about once in eighteen times.

Prices of equipment seem to bear little relation to the demand. One concern has not lowered its quotations on fixtures for more than a year, but continues to get its share of the business. Requests for technical assistance in working out lighting problems are coming in in good volume, with the question of price more or less disregarded.

Conduit Up With Second New Card Since January

MANUFACTURERS of rigid conduit have issued Card No. 50, which became effective April 15 and superseded Card No. 49, issued on Jan. 11. With the issuance of the new card conduit prices increased approximately 7 per cent. The actual decrease in discounts amounts only to 1 point, but a special discount of 5 per cent on Card No. 49 has been abolished so that the total rise is about 7 per cent in actual price. Discounts on Card No. 50 are now 46 per cent off list on ¼-in. to ½-in. galvanized conduit in less than carload lots and 52 per cent off on the same sizes of black pipe in similar lots.

This is without doubt a direct result of the present situation in the coal and steel industries. Steel mills are not seeking business on account of the possibility of a fuel shortage preventing operations. Stocks of rigid conduit are short, not only as far as jobbers are concerned but extending to manufacturers also. Construction is taking large quantities of pipe, and within the last week the realization has come that hand-to-mouth stocks cannot fill the demand. Orders have piled in on manufacturers, and the result has been a reaction of prices to higher levels.

Discussing the possibilities of a shortage, one large manufacturer stated to the ELECTRICAL WORLD that the situation is not acute now and probably will not be if the coal strike is broken by the beginning of May. However, should it last until the first of June, construction will be seriously impeded more by lack of raw material than by lack of fuel. The expectation is that coal production will increase soon and that the next six weeks will see the danger of a pipe shortage averted.

American Electrical Imports in March Are Unimportant

MUCH has been heard in recent months of the large amounts of electrical goods being imported into this country and of the harm being done American electrical manufacturers thereby. That there exists no basis, at least at present, for these fears is disclosed by figures gathered unofficially by the Bureau of Foreign and Domestic Commerce and covering electrical imports through the port of New York for March of this year. The total amounts to $26,250, or less than two-thirds of 1 per cent of the amount exported in the same month. Certainly, as far as the electrical industry is concerned, the balance of trade is in our favor. It is the intention of the bureau to gather these figures for April and then to discontinue the work unless these imports are in very much greater volume for the month.

Germany, according to the figures, occupies first place on the list of the countries from which we buy these goods. Her total sales to us for March amounted to $11,828, not quite half of the total. Our largest purchases from her, which were not so large at that, consisted of carbons, heaters and heating pads and table lamps. England sent us small amounts of dynamo brushes, heaters, telegraph instruments and radio apparatus, while France furnished us only dynamo brushes in any considerable amount. Czechoslovakia sold us only lighting fixtures, but the total for this item was $5,201, almost 20 per cent of our total imports. Switzerland, Belgium and Italy are represented in the list, but with negligible amounts. Data received by

SPECIAL PRELIMINARY FIGURES (UNOFFICIAL) SHOWING IMPORTS OF ELECTRICAL GOODS THROUGH PORT OF NEW YORK, MARCH, 1922

	Countries of Origin						
Kinds of Goods	Germany	England	France	Czecho-slovakia	Switzerland	Belgium	Italy
Carbons	2,720						
Dry cells	42						
Dynamo brushes		1,360	3,826				
Fans	104						
Hair driers	1,595						
Heaters–general	1,580	305					
Heating pads	1,550						
Immersion heaters	251						
Incandescent-lamp filaments			445				
Lighting fixtures	95		700	5,201			
Motors–small types	97		160			380	
Pocket flashlights	320						
Sockets	20						
Table lamps	2,218						195
Telegraph instruments		150					
Telephone condensers	600						
Time switches					560		
Vibrators	540						
Wireless apparatus	26	1,050					
Miscellaneous appliances	70				90		
Totals	$11,828	$2,865	$5,131	$5,201	$650	$380	$195
Total from all countries							$26,250

the bureau for the port of Boston indicate that March imports of electrical goods there did not run over $750, of which $505 represents fixtures and $182 heaters. These data do not include the last two days of March and may be slightly low.

The table does not include incandescent lamps, which for some time have been the United States' most important electrical import item and on which figures are given in the official monthly summary of foreign commerce. During February, the latest month on which figures are given, incandescent lamps were imported to the value of $36,725, while the average value for the eight months ended February, 1922, was $38,271 per month. A comparison of the totals of quantity and of value shows that most of these lamps must have been of the miniature type, the value per lamp having ranged around 2 cents.

Street Lighting Assuming Importance in Illumination Sales Work

THE most active branch of the illuminating industry just at the present time, says a large manufacturer, is the street-lighting branch. In the past few years it has got beyond the point where the city fathers would tell the city electrician to string a few lights at various corners, on the assumption that any sort of light was good enough for street lighting. Today the city engineer confers for a long time with sales engineers of manufacturers before deciding on just the type of post and shade and globe to use, the object being to obtain the most light and the best appearance. Manufacturers have taken advantage of the desire for better-lighted streets and in fact are more or less responsible for creating this desire through their educational campaigns.

Within the last three months these manufacturers of street-lighting equipment have been turning many of these inquiries and conferences of the last year into actual orders. For some reason small municipalities were somewhat hesitant to spend money during 1921 but are now either in better shape financially or are convinced it is no use waiting longer to invest in adequate street lighting. Orders are coming in mainly from cities of between 20,000 and 100,000 population, though there are a few large cities tentatively in the market. The greater part of this demand is, of course, for "white-way" systems rather than for boulevard or ordinary street-lighting; the first thing a town of moderate size demands is that its business section be as brilliantly lighted as that of any other town its size within a radius of a hundred miles. This spirit of friendly rivalry grows more the further west the town lies, and this perhaps is why sales of ornamental street-lighting systems are only fair in the East, very good in the Central West and excellent on the Pacific Coast.

Instrument Manufacturers Report Sales Holding Their Own

A FAIR demand with no great improvement looked for before fall is reported by manufacturers of electrical instruments. These manufacturers serve a widely diversified number of industries, however, so that, as at present, a slump in one industry often is made up for by an increased demand from another. Thus there is now a call for instruments for radio work that is bringing up the sales volume to a satisfactory total in spite of decreased sales of other types of instruments. The manufacturers have fallen behind in deliveries mainly because six months ago this demand was entirely unlooked for and none of them was in a position to go into quantity production.

There is little call for instruments for farm-lighting plant systems, and when business will develop here is hard to tell. Much depends on crops and crop prices during the coming summer. In the Middle West there is considerable optimism, for both grain and stock prices have shown an upward tendency, and the Pacific Coast should be a good market also. A slight improvement is noted in the South.

The automobile industry should take a large number of instruments before the year is over, though one instrument manufacturer informed the ELECTRICAL WORLD that the reported improvement in automotive conditions had not been felt by his company yet. However, there is no doubt that production of automobiles and trucks is increasing constantly, and it will not be long before the producers must come into the market for instruments. There is little demand from schools and colleges for laboratory instruments, but this is a seasonal business and will revive again when these institutions reopen in the fall.

Switchboard instruments are in very good demand and central stations have been buying in normal amounts since the first of the year. Industrial customers have also been in the market, and, outside of radio instruments, the switchboard types are showing the most activity. Portable instruments are also selling well, and what with the latter type, the switchboard and those for radio, the stagnant condition of the other markets is being discounted.

It is estimated that unfilled orders during the first quarter of 1922 were 75 per cent of those for the first quarter of last year. However, the current unfilled orders are almost entirely new business, while last year the greater part of orders on the books had been carried over. Deliveries now are normal against two to three months at the beginning of 1921. There has not been much change in prices, owing to the fact that 90 per cent of the manufacturing cost is for labor, and although wages have been reduced, the reduction has not been large enough to warrant much reduction in selling cost.

Metal Market Situation

STEEL mills in the Pittsburgh and other districts have plenty to do under present circumstance. They are working at from 70 to 80 per cent capacity as a result of the buying movement which began when the coal strike took on a serious aspect. Customers feared a shortage, and further price increases and orders piled up. So far the coal strike has not made itself much felt, but the mills are evincing a desire to husband their fuel supply. Some continue to sell, but a certain amount of conservatism is shown and a relatively quiet steel market may be expected for a while, with mills making fairly heavy shipments and buyers drawing on accumulated stocks.

The estimated production of tin plate in the first three months of this year is about 375,000 gross tons. Inasmuch as exports have been running fairly light, it follows that with a record production the shipments for domestic consumption were a record by a still greater margin. Prices are easily maintained.

The price situation in the copper market showed no change, the quotation being firm at 12¾ cents. There was little selling below this price and not many bookings at 13 cents. There was a slight recession of the buying movement of the week before. Export demand has been the mainstay of the market, and shipments abroad through the port of New York in the second week in April were 19,500,000 lb. The total shipped through New York in the first fifteen days of the month is around 26,000,000 lb.

NEW YORK METAL MARKET PRICES

	April 11, 1922	April 18, 1921
Copper:		
London, standard spot	£ s. d. 57 2 6	£ s. d. 59 5 0
	Cents per Pound	Cents per Pound
Prime Lake	12.87½-13.00	12.87½
Electrolytic	12.75	12.75
Casting	12.50	12.50
Wire base	14.00 -14.25	14.00 -14.25
Lead, Am. S. & R. price	5.00	5.00
Antimony	4.87½	5.00
Nickel, ingot	36.00	36.00
Sheet zinc, f.o.b. smelter	7.50	7.50
Zinc, spot	5.22½-5.27½	5.22½-5.27½
Tin, straits	30.50	30.87½
Aluminum, 98 to 99 per cent	19.16	19.10
OLD METALS		
Heavy copper and wire	11.00 -11.25	10.75 -11.12½
Brass, heavy	5.00 - 5.50	5.25 - 5.62½
Brass, light	4.75 - 4.87½	4.75 - 5.00
Lead, heavy	4.00 - 4.12½	4.00 - 4.25
Zinc, old scrap	2.50 - 2.75	2.50 - 2.75

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

BUSINESS continues to gain, though here and there a depression exists by reason of a local condition such as weeks of bad weather or strikes. Where trade has a fair chance there rarely fails to be an increase in sales. An instance of this is the territory around Atlanta, where the cessation of long rains has given farmers and planters a chance to start cultivation and has been the cause for more optimism in the small towns. Atlanta jobbers report fan season prospects very good. In St. Louis general business is on the increase, though labor troubles have almost stopped building. Chicago reports satisfactory business in a number of lines, and the steel mills there are working at an estimated capacity of 85 per cent. New England business is good outside of the textile area, and construction contracts awarded continue to break all records. In both Intermountain territory and the Pacific Northwest bad weather has cut down retail sales and has slowed up building of all sorts. However, lumbering and mining, the mainstays of these regions, are recovering. Another building strike looms in San Francisco and the bay cities, and such a development would have a serious effect on business.

NEW YORK

The improvement in electrical trade as reported last week has held up well, although the increases all along the line have been very gradual. Wiring supplies of all kinds are in very fair demand. Present indications are that this demand will continue to improve, as general building activity, not only in the residential sections but in the business districts as well, is decidedly on the increase.

Stocks are in very good shape, and prices remain steady with the exception of rigid conduit, on which the manufacturers have announced an increase of 7 per cent, putting Card No. 50 in effect.

The appliance business has shown more life during the past week than at any time since the first two weeks of this year. Jobbers state that this particular branch of their business seems to be rather periodical—a good number of orders is received at about the same time and then follows a lull of from six to ten weeks. The fan business has been exceptionally good this spring, and so far there has been no let-up in the demand for radio equipment.

Rigid Conduit.—Manufacturers have announced an increase of 7 per cent in the price of rigid conduit, and card No. 50 is now effective. While jobbers have not as yet prepared a new schedule of prices, quotations will be made at a 7 per cent advance over the following: For ½-in. black pipe in 2,500-ft. lots, $44.50; ¾-in., $58.10, and 1-in., $82.79 per 1,000 ft. Galvanized pipe in the same sizes and quantities is quoted at $50, $64.50 and $92.20 per 1,000 ft. Demand is steady and stocks of most sizes are ample.

Rubber-Covered Wire.—No change in price or conditions in the wire market was noted this week. There is a fairly active demand and jobbers' stocks are in good shape. No. 14 rubber-covered is quoted at $6.25 to $6.35 per 1,000 ft. in 5,000-ft. lots.

Flexible Armored Conductor.—This material continues in active demand and sales have been very good. Stocks are fair. Quotations on No. 14, two-wire, single-strip, range from $43 to $45 per 1,000 ft. for that quantity, and double-strip sells for $45 to $47 per 1,000 ft.

Sockets.—Schedule material generally is moving fairly well and jobbers have good stocks on hand. Pull sockets in standard-package lots of 250 are quoted at 33 cents each. Key sockets in lots of 500 sell for 18 cents, and keyless for 16 cents in the same quantity.

Dry Cells.—Standard cells are moving steadily. No. 6 regulars in lots of twelve to fifty sell for 34 cents each, in lots of fifty but less than a barrel for 30½ cents each, and barrel lots of 125 sell for 29 cents each. Quotations on ignitors are 1 cent higher than the foregoing for the same quantities.

Appliances.—Sales of heating devices have picked up considerably during the past week, and jobbers report some fair-sized orders for irons, toasters, percolators and grills. This business has been very spotty since January, and it remains to be seen whether or not the present activity will hold out.

Fans.—The fan business has been expectionally good this spring, and orders for stock continue to come through from dealers. More attractive prices this year and small carry-overs are largely responsible for better sales.

Radio.—Demand for wireless apparatus continues strong, and new dealers are appearing every day. Jobbers have little or no stocks, and some have expressed the opinion that this business will drop off sharply during the summer months because of static conditions.

CHICAGO

While the gradual improvement in the electrical industry seems rather slow, a curve with time plotted against volume of business probably would show a decided gain since the first of the year. Spring construction is under way so that most of the staple electrical equipment is moving fairly well. Wiring materials have been selling steadily for some time, and prices are often cut to allow very little profit. A good week for the high-tension manufacturers was reported. Increased activity in the sign industry was also announced. Radio is continuing to be the booming feature of the trade, but deliveries are always in the future. Both porcelain and bare stranded wire are being swept along with this boom.

During the week contracts were signed for two new 30,000-kw. units to be installed in the Calumet station of the Commonwealth Edison system. Under present plans the capacity of this station will be increased to 180,000 kw.

Wire.—The steady action on No. 14 rubber-covered wire noted during the last few weeks has been sustained, practically all jobbers reporting a good volume of business. No price changes have been noted, and it still sells around $6.25 per 1,000 ft. in 5,000-ft. lots. Stocks are ample. The demand for both weatherproof and bare wire has been steady, and there have been no variations in price.

Rigid Conduit.—The good movement on conduit during the week seems to indicate that building construction has started. The ½-in. black pipe sells in 5,000-ft. lots for $40 per 1,000 ft. Stocks are good.

Flexible Armored Conductor.—A similar activity in armored conductor has resulted in a good movement on the No. 14 two-wire, single-strip size. The price on this material varies between $41 and $42.50 per 1,000 ft. in 5,000-ft. lots.

Signs.—Business in this line is good and inquiries are increasing. One company reports that the average 1922 business is 25 per cent higher than last year's. All sizes are moving well and several new installations of theatrical signs have been made.

Porcelain.—An improved market for insulators has been noticed, possibly due to radio requirements. No price changes have been announced.

Metal Molding.—The movement appears to be rather sluggish. The three-wire size sells around $50 per 1,000 ft. in 1,000-ft. lots.

Lamp Cord.—The market for lamp cord has fallen off a bit and sales are scattered. The No. 18 parallel, 64-in. insulation, cotton, is available for $16 per 1,000 ft. Silk in the same size is quoted at $27 per 1,000 ft.

BOSTON

A gradual improvement in general business conditions is apparent. The building industry is expanding rapidly, contracts for the week ended April 11 totaling $13,314,800 for New England. The preceding week's total was $9,279,100, and a year ago the figure was $4,070,400. This is again the best week's record for twenty years, according to the Dodge reports. Retail trade in New England is improving outside the textile strike areas. While many orders of moderate size are being handled by jobbers in the electrical wiring line, the demand is better as a whole, and the measured upward trend of trade is regarded as healthier than a boom. Money is getting easier and the building of new residences is rapidly progressing toward a point where the increased demand for electrical supplies will be marked. Some of the New England electrical factories which were operating at a low ebb last winter are picking up gradually. Non-employment is lessening. The demand for electrical accessories for automobile service is growing and nothing seems to check the extraordinary interest of the general public in radio equipment. Central-station earnings in many quarters are better than last year.

Storage Batteries.—Trade is brisk, especially in the smaller sizes used in connection with radio telephony and automobile service. Prices are firm, and so far stocks are meeting the situation well.

Loom.—Fair sales are being handled for interior points. Prices are quiet, 1,000-ft. lot orders going through at $15.50 per 1,000 ft. on the $\frac{7}{32}$-in. size and at $18 for the $\frac{1}{4}$-in. size. Stocks are adequate.

Wire.—Buying has picked up somewhat on insulated wire. Rubber-covered No. 14 sells at $6.75 per 1,000 ft. in 5,000-ft. lots. Weatherproof base is steady at 16 cents. Very little bare is moving this week, apart from scattering trolley and central-station requirements. Bare base is 15 cents.

Tape.—Friction tape is moving in hand-to-mouth quantities. In less-than-10-lb. lots the $\frac{3}{4}$-in. black is quoted at 45 cents per pound, and at 35 cents in 100-lb. lots; white tape in corresponding lots, 90 cents and 80 cents. The supply is ample.

Sockets.—Competition between different grades of sockets and for small-order business is holding down prices. In case lots, pull sockets now move at 32 cents net. There is much dissatisfaction over prices among jobbers.

Lamps.—Lamp orders are tapering off seasonally, and the advent of statewide daylight saving April 30 will cut further into sales. By and large, however, the past year's lamp business in this district has been remarkably good in comparison with many other lines. Replacement orders are active in mills, and much new business is being handled as a result of central-station house-wiring campaigns.

Radio Equipment.—One local manufacturer is booked well into 1923 on radio-telephone equipment, and business is still coming. The exhibits in retail display windows are largely unsupported by stocks beyond very restricted assortments.

ATLANTA

Little change in electrical jobbing lines has taken place during the past week, though conditions in general have somewhat improved. Dry weather has allowed the farmers to commence active work of preparation of the soil and planting. Fertilizer manufacturers and dealers report that business improved greatly during March, after having been very dull during the early part of the season. Railroads coming into Atlanta report that shipments of fertilizer during March were 15 per cent greater than in March, 1921. While planting is later than usual, the ability to get into the fields and do some tangible work is having a beneficial effect in the rural communities. Business in the small towns is reported somewhat improved over thirty days ago.

Textile-plant operation throughout the territory is very spotty, some of the mills operating full time, some overtime, while a few are shut down for an indefinite period. Knitting mills seem to be fairly busy, while the overall plants report a healthy volume of orders. Building permits continue to be taken out in good volume and this should shortly be reflected in a brisk movement of all electrical building material. Construction of moderately priced homes continues to feature the building development. Building activities are reported throughout the Southeast, and as a result of this development the lumber and common brick industries have been stimulated and non-employment is being reduced. It is predicted that non-employment in Georgia will have virtually disappeared by July.

Safety Switches.—The movement in this line continues to hold up well, and the popular sizes show a very satisfactory gain in sales. In general, stocks are in good shape with factory shipments satisfactory.

Poles.—Sales of poles are reported only fair. High freight rates have caused purchasers to call for local-cut poles in a number of instances. Producers have accumulated good to heavy stocks and shipments are prompt.

Lamps.—The price reduction in lamps on April 1 caused a slight flurry of buying, but business has again settled to its normal volume for this period of the year. Stocks are in good shape throughout the entire line.

Schedule Material.—Building activities have not yet stimulated this line, though a more active market is anticipated in the near future. The entire line of schedule material is well stocked throughout the section.

Fans.—The first little touch of hot weather is stimulating fan sales, and there are prospects for a very successful season. Jobbers' and retailers' stocks have been brought into good shape in anticipation of the demand.

Exhaust Fans.—This line continues to move steadily, particularly in sizes up to 30 in. Sales in this line are not so good as in buzz fans, but hot weather is expected to cause a better movement in the near future. Local stocks are in good shape with factory shipments on special sizes satisfactory.

Lighting Fixtures.—Industrial, commercial and residential lighting fixtures are all showing a healthy movement, commercial and residential types being particularly good, though the more expensive variety in commercial fixtures leads in popularity. Jobbers' stocks are in excellent shape throughout the territory.

ST. LOUIS

Business generally shows continued improvement of a solid character. One of the dominant factors is the greater purchasing power in the agricultural districts, occasioned in part by higher prices of grains, but due principally to substantial improvement in the pork and beef markets. Until the recent heavy rains the outlook for this year's crops was excellent, and no official reports have been issued showing the effect of the abnormally heavy precipitation during the past two weeks. High water has overflowed farming land in some places, but not sufficiently to affect the general agricultural conditions.

The industrial plants continue to extend their operations. A street-car manufacturing company recently resumed work and is re-employing additional men at the rate of about 100 per week as the result of orders placed in the last thirty days. A large steel company announces its intention to go from one-third capacity to two-thirds capacity in the next three weeks. Conservatism still rules the market, and as a result there are a large number of small orders.

Construction work in St. Louis is virtually at a standstill until some settlement can be reached between the contractors and the carpenters regarding wages. Outside of St. Louis, where money is probably a little tighter, extensive construction is being held back by high prices of materials. Notwithstanding these conditions small residential jobs are demanding an increasing amount of wiring materials and devices.

Cross-Arms.—While the total movement is still small compared with normal times, it is much heavier than has been experienced for several months. Buying is principally for distribution work of the central stations, as the transmission jobs have not yet materialized. Stocks are in excellent condition, and prices for fir arms, 3¼-in. x 4¼-in.,

per 100, f.o.b. St. Louis, are nominally as follows: 3-ft., $51.38; 4-ft., $68.31; 6-ft., $102.77; 8-ft., $137.03; 10-ft., $152.25.

Dry Cells.—The demand has slackened slightly the last few weeks, but on the whole has been exceptionally good so far this year. The steady demand and the firm prices have resulted in the carrying of comparatively liberal stocks. In barrel lots, the regular item is priced at 31 cents each and the ignitor at 32 cents each. The four-cell battery is priced at $1.70 each in lots of twenty-four and at $1.80 each in smaller lots.

Bell-Ringing Transformers. — Though improvement in sales is reported, the total demand is comparatively small. Education of the public to the greater use of this device is needed before there will be substantial movement.

Tape.—This item is moving in attractive amounts, though the individual orders are small. On account of the conservative policy in stocking, individual jobbers' stocks are occasionally exhausted. A local manufacturer reports business about 25 per cent better than a year ago. Friction tape is priced from 35 cents to 60 cents per pound. depending upon quality, the largest sales being for a 38-cent grade. Rubber tape is priced at 36 cents per pound.

Soldering Materials.—Representative prices are about as follows: Paste, 5 cents per ounce; soldering sticks, 14 cents per stick; salts, 36 cents per ½-lb. can in lots of twenty-five; wire solder, 22 cents per pound; bar solder, 25 cents per pound; ribbon solder, 24 cents per pound. The demand is up to the general average of wiring materials and stocks are in good shape.

PORTLAND—SEATTLE

Continued bad weather is affecting retail sales, road construction, building construction and logging operations. This season is from three to four weeks behind this year. The continued increase in lumber production from week to week is one of the bright spots in the business revival of the Northwest. Production for the week ending April 8 was only 6 per cent below normal. It is reported that the lull in Japanese buying is over and that from now on that market will be active.

The gradual increase in the price of agricultural products is putting new life and hope into the hearts of the rural population, and as a result business throughout the country districts is noticeably improved. The electrical business is moderately good. The outstanding feature is the inability of deliveries of radio apparatus to meet the unprecedented demand for this class of material. The Gray's Harbor Railway & Light Company recently let a contract for a 3,750-hp. steam turbine-generator set to add to its present generating capacity. Bids for supplying switching equipment for the City of Seattle's Skagit plant have been opened. The lowest bid calls for the expenditure of $115,000. Manufacturers' agents of Portland report business improving materially in the past week or two. Both inquiries and bookings are active. Jobbers report business fair, the greatest activity being in wiring devices. Some price reductions have been noticed during the past week. Single-pole plug switches and switch plates, flexible-conduit fittings and porcelain cut-outs all record a drop of approximately 10 per cent. Contractor-dealers of Portland report store sales inactive. Fixtures are exceptionally good, and wiring demands, particularly for residence and apartment work are active.

Knobs.—Solid No. 5½ knobs are quoted at $9.65 per 1,000 in packages of 500. "Nail-it" knobs are quoted at from $18 to $22 per 1,000 in barrel lots and lots of 500 respectively.

Tubes.—3-in. x $\frac{7}{16}$-in. tubes are quoted at from $4.95 to $5.85 per 1,000 in lots of 500.

Loom.—Demand is fair. The $\frac{3}{64}$-in. loom is quoted at from $16.35 to $18.50 per 1,000 ft. in coil lots.

Insulators.—No. 9 phonograph insulators are quoted at $56.05 per 1,000 in barrel lots of 400. No. 20 double-petticoat glass insulators are quoted at $82.80 per 1,000 in barrel lots of 200.

SAN FRANCISCO

The prevailing industrial harmony of San Francisco and the bay region apparently will be broken by the refusal of the unions to work alongside non-union men. So far the plasterers and bricklayers are the only unions out, but unless some mediation is accepted by the extremists of both sides another builders' strike is looming. The peak of non-employment seems to have been passed. Crops are coming along nicely, a little damaged here and there by frost, but standing up surprisingly well everything considered. Export business is improving, although so far electrical supplies have not been greatly affected.

Batteries.—Battery business is somewhat better than last year, being greatly increased by the big demand for wireless radio batteries. Standard bell batteries are selling in lots of fifty for 37 cents each, in barrel lots for 35½ cents each, and the ignitor for 38 cents each and 36½ cents each respectively.

Conduit.—Twin-armored conduit, No. 14 size, is selling for $93 per 1,000 ft. in coil lots, and No. 18 armored lamp cord in coil lots for about $16 per 100 ft. with an approximate 10 per cent decrease in five-coil lots.

Metal Molding.—Metal molding has just dropped about 25 per cent. The demand is very steady, principally because certain contractors like to use this molding and make a practice of doing so in each of their jobs.

Wiring Material.—Wiring material is very active. Big stocks are arriving and are often largely sold before their arrival, conditions on certain items of this line recalling 1919 conditions. A feature of this business is the low prices made on the standard items.

SALT LAKE CITY—DENVER

A recurring spell of winter in the Intermountain regions is having a depressing effect on business. Sales in all lines for the past month have shown a decline. Cottage building has begun, and building permits issued indicate a big summer in construction of homes. The campaign is being greatly facilitated by easily available loans. Builders' hardware and electrical construction materials are moving in better volume than this territory has seen in several years. Road men report a better tone prevailing among retailers generally. Orders are being obtained at a rate that points to satisfactory revival. Collections are easier and credit is steadily improving. There is money for every legitimate enterprise, with financing concerns running competitive advertising campaigns to get clients.

The War Loan Corporation is still active in the Mountain States supplying much-needed aid to the live-stock and beet-sugar industries. These are two of the basic sources or wealth here, and the outlook now is highly promising. Great reclamation and power projects are pending development which, when under way, will employ thousands of men now idle.

The coal strike is reported to be making some slight gains in the non-union fields. Agitators from the strike centers are busy securing recruits and organizing walkouts. There is little appearance of worry about the strike among owners of industrial plants, the supplies of coal on hand seeming to be ample to meet the needs for an indefinite period.

Auto Lamps.—Stocks are ample to meet all demands. The improved market for used cars has created a corresponding improvement in auto lamp sales.

Vacuum Cleaners.—Most electrical advertising is concentrating on this seasonable line. Dealers are placing some fairly good orders in anticipation of business when spring comes and housecleaning gets under way.

Wire.—Wire, both bare and insulated, continues to move sluggishly. There is little line construction under way, and there is a tendency to retrench in the matter of repairs. Stocks are heavy, with no price changes noted.

Radio.—Wide interest is being shown in radio. The public is aroused and dealers are clamoring for stocks. Jobbers are practically helpless, awaiting stocks that are slow in coming.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Hygrade Lamp Company to Enlarge Plant

The Hygrade Lamp Company, Salem, Mass., has completed plans for an extension of its plant. The addition will be of mill construction, four stories high, 50 ft. wide and about 110 ft. long. It will include quarters for the packing department, quality department, engineering department, a centralized pump room, storage facilities, and cafeteria, hospital, dance hall, smoking room and other accommodations for employees. It is expected to complete the addition by August.

Petition for Midwest Engine Company Receivership Withdrawn

A suit for receivership for the Midwest Engine Company, Indianapolis, which was filed by the General Electric Company in a federal court recently, has been dismissed by the petitioner. It is understood that another complaint differing in several particulars from the one filed may be filed later. The petition alleges that the Midwest Engine Company had on Feb. 21, 1922, nominal assets amounting to $12,875,433.36 and liabilities of $6,379,945.51. Of these liabilities $4,349.69 was due the plaintiff and $1,046,950 was due to Indiana Trust Company, trustee. It was stated the company was wholly solvent, but that in order to pay its debts in full it would be required to sacrifice its assets in a manner which would so impair the credit of the company that it no longer could continue in business. In order that business may be carried on, the appointment of a receiver was asked for.

It is understood that the filing of an amended complaint by the plaintiff and an answer of admission by the defendant were considered by the parties to the suit, but this plan was discarded finally and the suit dismissed.

Graton & Knight Make Changes in Management

Important changes in the management of the Graton & Knight Manufacturing Company, Worcester, Mass., belting manufacturers, were made at the recent annual meeting of shareholders. Preferred shareholders as a result of the passing of the dividend on preferred shares had the right to vote and elected a minority of the board. The new directors are: Stanley A. Russell, vice-president National City Company; W. R. Grace, vice-president and treasurer Ingersoll-Rand Company; George DeB. Greene, E. H. Rollins & Son; H. G. Stoddard; W. M. Spaulding; Dr. Homer Gage, and J. E. White.

Mr. Spaulding who was formerly president of the company, will remain as chairman of the board. J. E. White has been chosen as the new president and general manager. He is president of the Worcester Bank & Trust Company and will remain identified with the management of the bank while giving the necessary time to the management of the company.

Mr. White issued this statement;

"The new management is assured the active and loyal co-operation of both common and preferred shareholders. The officers, heads of departments and employees have signified their desire to do the utmost in working out the future of the company, and with loyalty we are sure of splendid results."

March Activity for Electric Furnace Company

Increased activity among the railroads and in the railroad supply field is indicated by recent sales of electric furnace equipment reported by the Electric Furnace Company, Salem, Ohio. A large Western manufacturer of manganese-steel castings for railroad purposes has just placed an order for a 250-kw. car-type Baily annealing furnace for one of its plants on the Pacific Coast. This equipment will have a capacity to heat 17 tons of manganese steel per day.

Another order received in March calls for a 125-kw. melting furnace for ferro-manganese. This furnace is to be installed at the plant of the Pettibone-Milliken Corporation, Chicago, and will have a capacity of 1,000 lb. of ferro-manganese per hour.

The Griffen Wheel Corporation has ordered a 75-kw. melting furnace for melting bronze for railway bearings. This furnace will have a hearth capacity of 1,000 lb. and will be installed at Tacoma, Wash. The Best Foundry Company, Bedford, Ohio, a subsidiary of the American Stove Corporation, has contracted for a 50-kw. 500-lb. melting furnace for melting its copper-zinc alloys. April sales also are expected to be good.

Constructive Program for National Electrical Credit Association Meeting

Twenty-third Annual Meeting at Detroit to Discuss Problems of Financing Electrical Industry—Jobbers' Credits Attract Attention

Arrangements have been completed for the twenty-third annual meeting of the National Electrical Credit Association, to be held at the Hotel Statler, Detroit, May 18-19. A large attendance is expected this year because in the past year credits and collections became two of the most important business activities. The tentative program is as follows:

THURSDAY, MAY 18

9:00 a.m.—Registration, greetings by president, reports from board of managers, report of auditing committee, report of secretary-treasurer, announcements of committees on arrangements and entertainment.

10:30 a.m.—Problems of financing the electrical industry.

11:15 a.m.—The trend of distribution within the electrical industry.

11:30 a.m.—Discussion to be led by a member of Philadelphia association.

11:45 a.m.—Open discussion of same subject.

12:00 a.m.—Creative credit management (paper by member of New England association).

12:15 p.m.—Discussion to be led by member of Central Division association.

12:30 p.m.—Open discussion of same subject.

12:45 p.m.—New business.

1:00 p. m.—Luncheon.

2:30 p.m.—Entertainment by committee in charge.

FRIDAY, MAY 19

9:30 a.m.—Credit problems and solutions (paper by member of New York association).

9:45 a.m.—Discussion to be led by member of Pacific Coast association, if present; if not present, to be led by Central Division member.

10:00 a.m.—Open discussion of same subject.

10:15 a.m.—The credit problems of the electragist, and how jobbers' credit men may help in their solution.

11:00 a.m.—Comparative financial statements, and their value as a basis for credit (paper by member of Central Division association).

11:15 a.m.—Discussion to be led by member of Philadelphia association.

11:30 a.m.—Open discussion on same subject.

11:45 a.m.—The viewpoint of the ultimate consumer of merchandise.

12:15 p.m.—Open discussion of same subject.

12:30 p.m.—Résumé and suggestions.

1:00 p.m.—Adjournment for luncheon at golf club and tournament play during afternoon.

7:00 p.m.—Banquet—Hotel Statler.

Allis-Chalmers Report Shows 1921 Profits

The annual report for 1921 of the Allis-Chalmers Manufacturing Company, Milwaukee, shows that the company earned $4.07 per share on its $26,000,000 worth of common stock. The net profits were $2,215,468 as compared with net profits of $3,564,249 the year before. Sales billed during the year were $24,685,258, against $31,516,209 in 1920, $30,224,083 in 1919 and $35,031,233 in 1918. The surplus for the year after payment of dividends, charges and federal taxes, was only $29,827, as compared with $1,647,207 the year before.

Woodward Governors Sold on 7,500-Hp. Units

The statement made in the April 8 issue of the ELECTRICAL WORLD that the Woodward Governor Company supplied waterwheel governors ranging from 1,500 hp. to 20 hp. was incorrect. The governors installed varied from 7,500 hp. down.

Dutchess Bleachery to Sell Own Insulation Products

Sales of the products of the insulation division, Dutchess Bleachery, Inc., Wappingers Falls, N. Y., will be controlled hereafter by the Dutchess company itself. The company manufacturers varnish-insulated fabrics. Under the previous arrangement the American Di-Electrics, Ltd., 466 East Seventh Street, Brooklyn, had charge of sales. The Dutchess company recently opened a new coating plant at Wappingers Falls, which at full capacity will have an output of 2,000,000 yd. of varnished fabrics per annum. Additional equipment is under course of construction. Charles A. Barker is managing engineer.

Crocker-Wheeler Reports Good First-Quarter Business

While the first quarter of the current year perhaps will not be so profitable as the corresponding period of 1921, according to A. L. Doremus, vice-president Crocker-Wheeler Company, new business has run considerably ahead of last year and the outlook is much more healthy. The first three months of 1921, Mr. Doremus said, saw the delivery of many orders which had been carried over from the previous year, and with prices higher than at present this meant a profit in spite of the fact that the sales curve was steadily slumping. This year, on the contrary, sales are constantly increasing, while there is little in the way of back orders. January, February and March each showed an increase in sales over the preceding month and, taken collectively, were the best three months for the company in more than a year.

A large part of this business has been done in engine-generators for isolated power plants, while motor sales have been steadily holding their own. Contracts for generating equipment for a number of large buildings have been obtained by the company since the first of the year, and it is expected also to supply a good part of the motor equipment for these buildings. Business coming in through general trade channels also is picking up, and the expectation, Mr. Doremus said, is that the second quarter this year will outstrip the second quarter of last year.

The radio business is also occupying a share of the company's attention, and, according to Mr Doremus, this department is working to capacity. There is litle doubt, he said, of the future of the radio industry, though it will never replace the telephone or the phonograph. It has, however, a very definite place.

Electric Storage Battery Has $10,015,812 Gross Sales

The consolidated annual report for 1921 of the Electric Storage Battery Company and the Willard Storage Battery Company, both of Philadelphia, show gross sales of both companies to have been $10,015,812. Gross sales of the two companies for 1920 were $12,134,614, so that last year's business showed a drop of approximately 17½ per cent from that of the year previous. The net earnings for 1921, before payment of federal income and excess profits taxes, were $5,602,383 as compared with $6,157,091. Federal taxes for 1921 are estimated at $1,100,000.

Business of the company during the first quarter of 1922 has recovered very substantially over the amount done in the first three months a year ago, when factory operations were running about 60 per cent of capacity. The new plant at Crescentville is being prepared with machinery and equipment so that it can be turned over for manufacturing within sixty days after it is definitely decided to put in operation. No date has yet been decided on for starting this new unit.

There has been considerable revival in demand for batteries for central stations and also for train-lighting equipment. The company also finds real improvement in the automobile trade, which buys starting and lighting equipment. One day recently a record output of batteries is reported to have been made in the automobile equipment department.

Radio development is opening up a new and profitable field for the company, all radio equipment including batteries. The manufacturers are mainly interests with which the company already had well-established business relations.

General Electric Opens Porcelain Plant

The porcelain plant of the General Electric Company at Pittsfield, Mass., which has been idle nearly six months, has been reopened. It is expected that within two or three months the plant will be at about 50 per cent capacity.

Radio Corporation Swamped by Demand Last Fall

The 1921 report of the Radio Corporation of America states: "The demand for radio apparatus came up very much overnight, and no apparatus had been developed which lent itself to quantity production. Radio as an art is advancing very rapidly. Owing to the continuous research which has been carried on, apparatus embodying the latest improvements and of a character suited for general use has now been developed for manufacture in large quantities, and it is believed by the officers of the corporation that the demand, large though it may be, will soon be filled."

The company reports that the transatlantic circuits are now carrying about 20 per cent of the international message traffic between the United States and Europe. Gross income for the year amounted to $4,160,844 the net profit on which was $426,799, which amount was applied against reserve for depreciation and patents.

Suit Alleges Infringement of Marsh Patent

The owners of the Marsh patent have filed suit against Otto Reiman of Chicago for infringement of the Marsh patent covering the use of certain alloys in the construction of electric heating units. It is understood that Otto Reiman is selling heating appliances using an alloy sold under the trade name of "Sicro" or "Silichrome" in the construction of the heating units of these appliances.

The H. T. Paiste Company, 3210 Arch Street, Philadelphia, manufacturer of electrical equipment and supplies, has awarded contract for a new four-story plant, 104 ft. x 108 ft., at Thirty-second and Cherry Streets, to cost in excess of $100,000.

The General Electric Company has appointed H. L. R. Emmet manager of the production department of its Schenectady works to succeed Langdon Gibson, retired on account of ill health.

Roy R. Burnham, consulting engineer, formerly at 15 Beacon Street, Boston, has moved his offices to 119 Water Street, Boston.

The Eager Electric Company, Watertown, N. Y., manufacturer of motors, dynamos and electric specialties, has announced the establishment of a Western selling agency with the Julius Brunton & Sons Company, San Francisco.

The Fuller Engineering Company, Allentown National Bank Building, Allentown, Pa., has just closed a contract with the Tennessee Coal, Iron & Railroad Company for the installation of coal-drying, pulverizing and conveying systems to serve the Tennessee company's new boiler installation at Ensley, Ala.

Foreign Trade Notes

GERMANY EXPORTING ELECTRICAL MACHINERY TO CHINA.—Since the import trade has been revived and the building of business houses, roads, railways and factories has been resumed in China, *Commerce Reports* states, German firms have been doing a large business in electrical machinery. A German firm is competing with an American company for the contract for installing a telephone system in the principal city of Shantung and also in Shanghai, where a sugar refinery is to be established which will have a working capital of £2,500,000 and will require a complete new outfit of machinery.

MARK'S DECLINE HITS GERMAN ELECTRIC CONCERN.—The annual report of the Siemens Elektrische Betriebe, according to Associated Press reports, shows the stockholders to have been severely hit by the appreciation of foreign exchange, especially that on Swiss money. The report states that the company's debt on this account amounts to 183,000,000 marks. Part of this can be recovered from the reserve fund, but there remains an uncovered loss of more than 162,000,000 marks.

New Apparatus and Publications

HOISTS.—The New Jersey Foundry & Machine Company, 90 West Street, New York City, has recently brought out an electric hoisting machine, under the name of "Handiman." It can be furnished for operation on both alternating current and direct current.

EVAPORATOR SYSTEMS.—The Griscom-Russell Company, 90 West Street, New York City, is distributing bulletin No. 360, describing the "Griscom-Russell" evaporator systems for the economical production of distilled boiler-feed water.

RANGES.—The George D. Roper Corporation, Rockford, Ill., is distributing a circular describing its No. 2,001 R. E. type 12 and No. 2,001 R.M.M.A. type 12 electric ranges.

LIGHTING DATA.—The Edison Lamp Works of General Electric Company, Harrison, N. J., is distributing bulletins L.D. 135, L.D. 136, L.D. 137 and L.D. 107A, entitled "The Lighting of Public Buildings," "Church Lighting," "Residence Lighting" and "The Edison 'Mazda' Lamp for Motion-Picture Projection" respectively.

SIGN DEVICES.—The Reynolds Electric Company is distributing a poster illustrating the "Reco" devices for electric signs, including color hoods, flashers, motors of 1/20 hp. to ¼ hp., reflectors for bulletins and billboards, and also the "Reco" food mixers for restaurants, etc.

RECEPTACLE.—Pass & Seymour, Inc., Solvay, N. Y., are distributing a leaflet describing their new deep box receptacle and loom-box strap.

LAMP HANGERS.—Data sheets have been issued by the F. W. Wakefield Brass Company, Vermilion, Ohio, giving information on the "Red Spot" line of hangers designed for use with the urn-shaped glassware at present being used for commercial lighting purposes.

INSTRUMENTS.—Bulletin 322 issued by the Esterline-Angus Company, Indianapolis, covers its various graphic instruments, including meters, portable transformers, etc.

CEDAR POLES.—The Bell Lumber Company, Minneapolis, has issued its 1922 catalog, containing sixteen pages, in which it describes the manufacture of Western red-cedar and Northern white-cedar poles, with particulars about creosote treating and the official specifications.

RADIO BATTERY CHARGER.—The Ward Leonard Electric Company, Mount Vernon, N. Y., is distributing a leaflet describing the "Ward Leonard" vitrohm radio-battery charger for use on a 110-volt direct-current line.

VALVES.—The Atlas Valve Company, Newark, N. J., has issued a small handbook (first edition), which is a reference book of rules, tables, curves, data and formulas, to determine the correct size and capacities of reduction valves and pipe connections.

BOILERS.—The Heine Boiler Company, St. Louis, is distributing bulletin No. 51, entitled "Boiler Practice for Textile Mills," in which it describes and illustrates various "Heine" boiler installations in textile plants and also the first "Heine" boiler after thirty-five years of continuous service.

CONVERTER.—Bulletin No. 130, entitled "Light for Motion Picture Projection," issued by the Wagner Electric Manufacturing Company, St. Louis, describes the "Wagner" white-light converter for motion-picture projection.

MOTOR STARTER.—The Monitor Controller Company, Baltimore, has issued bulletin No. 102, which gives instructions regarding the Monitor "Thermaload starter."

PANELBOARDS.—The Sprague Electric Works of General Electric Company, 527 West Thirty-fourth Street, New York City, is distributing a four-page leaflet covering "Sprague" narrow-unit panelboards (safety type).

New Companies

THE LAUREL RUN (PA.) ELECTRIC COMPANY has been incorporated with a capital stock of $10,000 to supply electricity for lamps, heaters and motors. The incorporators are R. V. Moyles, 114 Park Avenue, Wilkes-Barre; T. M. Moyles, Wilkes-Barre, and others.

THE GENERAL UTILITIES COMPANY, Covington, Ky., has been incorporated with a capital stock of $100,000 by Frank S. Hitch, Walter E. Falk and L. B. Falk.

THE INDIANA POWER COMPANY, Vincennes, Ind., has been incorporated with a capital stock of $1,000,000 to do business in Illinois.

THE HOLSTON RIVER POWER COMPANY has been organized by Gen James B. Cox, Johnson City, Tenn., to construct three dams on Holston and Watauga Rivers. F. Butler, Orbisonia, Pa., is engineer.

THE EAST TENNESSEE HYDRO-ELECTRIC COMPANY, Johnson City, Tenn., has been organized by Gen. James B. Cox to develop the water power of Clinch and Powell Rivers in Anderson, Claiborne and Grainger Counties in east Tennessee. F. M. Butler, Orbisonia, Pa., is engineer.

Record of Electrical Patents

Notes on United States Patents

(Issued March 28, 1922)

1,411,043. CONTROL SYSTEM; Edwin S. Lammers, Jr., Wilkinsburg, Pa. App. filed March 8, 1919. Field control for motors and generators on closed circuit.

1,411,074. ADJUSTABLE CASING FOR THERAPEUTIC APPLICATION OF LIGHT; Fritz A. Anderson, Milton, Wis. App. filed April 30, 1921. For accurately directing light.

1,411,080. IMPULSE-STARTER COUPLING; Albert Erickson, Chicago, Ill. App. filed April 10, 1918. Spring attachment produces high speed for starting.

1,411,112. ELECTRIC ALARM SYSTEM; Walter S. Ludlow, Jr., Cincinnati, Ohio. App. filed May 6, 1918. Watchman's time-recording and fire-alarm service combined.

1,411,131. ELECTRICAL SWITCH; Oscar S. Swanson, Jamestown, N. Y. App. filed Dec. 10, 1918. For lamp sockets.

1,411,157. FURNACE FLUE CLOSURE; Walter E. F. Bradley, Los Angeles, Cal. App. filed July 5, 1919. Furnace employed for metallurgical reduction.

1,411,158. ELECTRIC FURNACE CONSTRUCTION; Walter E. F. Bradley, Los Angeles, Cal. App. filed Aug. 27, 1918. Electric arc type for metallurgical operations.

1,411,161. ELECTRIC FITTING; Hoyt Catlin, Bridgeport, Conn. App. filed Oct. 3, 1919. Balances load on three-wire electric ranges.

1,411,194. SPARK-PLUG PROTECTOR; Morrison M. Sharp, Waxahachie, Tex. App. filed Aug. 16, 1919. Protects plug from moisture.

1,411,206. REEL FOR PORTABLE ELECTRIC LAMPS; Michael Dorion, Rumford, Me. App. Feb. 2, 1918. For convenient shifting of portable lamps.

1,411,235. SOUND-REPRODUCING MACHINE; Charles L. Chisholm, New Glasgow, Nova Scotia, Can. App. filed Oct. 18, 1915. Phonographic reproduction by means of of microphone.

1,411,243. ELECTROMAGNETIC CLOCK; Maurice P. Favre-Bulle, Paris, France. App. filed Sept. 23, 1920. Pertains to connection between pendulum and rocker arm.

(Issued April 4, 1922)

1,411,256. ELECTRODE FOR ELECTRIC CELLS; Robert Amelm and Carl O. J. Montelius, Stockholm, Sweden. App. filed May 27, 1919. Composed of flattened tubular receptacles.

1,411,263. ELECTRICAL CONNECTOR; Frank Bellis, Chicago, Ill. App. filed Dec. 9, 1920. For use on apparatus subjected to vibration.

1,411,269. MULTIPLE-CONTROL APPARATUS FOR ELECTRIC RAILWAYS; Abraham Couwenhoven, Höngg, Switzerland. App. filed April 16, 1919. Means for operating control motors.

1,411,293. SWIVEL PLUG; Ralph S. Mueller, Cleveland, Ohio. App. filed Nov. 23, 1916. Screws into lamp socket.

1,411,309. MOTOR-CONTROL SYSTEM; Leigh J. Stephenson, Chicago, Ill. App. filed Nov. 28, 1919. Direct-current motors for operating mill rolls, hoists, etc.

1,411,311. TEMPERATURE COMPENSATION FOR ELECTRIC INSTRUMENTS; Raymond H. Sullivan, Rochester, N. Y. App. filed Dec. 16, 1910. By balanced resistances of different temperature coefficients.

1,411,333. SOLDERING-IRON HEATER; Leonard J. Fazendin, Orillia, Ontario, Can. App. filed Dec. 20, 1920. Head of iron short-circuits heavy current coil.

1,411,339. SPEED-REGULATING APPARATUS; Valère A. Fynn, St. Louis, Mo. App. filed April 25, 1918. Adjusts speed of prime movers, such as internal combustion engines.

1,411,340. WELDED JOINT AND METHOD AND MEANS FOR MAKING SAME; John F. Gail, Evanston, Ill. App. filed March 31, 1920. For metal bed and furniture construction.

1,411,354. POLYPHASE DYNAMO AND MOTOR; Alexander Heyland, Brussels, Belgium. App. filed June 1, 1914. Two-phase and three-phase repulsion motors.

1,411,366. ELECTRIC TRANSMISSION ARRANGEMENT; Antonin Monteilhet, Paris, France. App. filed May 6, 1913. Telephotographic system for long distances.

1,411,385. SIGNALING APPARATUS; Samuel P. Shackelton, New York, N. Y. App. filed April 1, 1918. Ringing apparatus for composited telephone and telegraph lines.

1,411,393. DYNAMO-ELECTRIC MACHINE; Hans Weichsel, St. Louis, Mo. App. filed Dec. 17, 1920. Connection of field windings on automobile starters.

1,411,394. ALTERNATING-CURRENT ARC-WELDING APPARATUS; Edward J. Wiggins, Buffalo, N. Y. App. filed June 20, 1919. Transformer converts polyphase into single-phase.

1,411,396. ELECTRICAL RESISTANCE THERMOMETER; Charles H. Wilson, Mount Vernon, N. Y. App. filed March 10, 1921. Reduces lag in readings.

1,411,414. STORAGE BATTERY; Thomas R. Cook, East Cleveland, Ohio. App. filed April 7, 1919. Pertains to sealing sleeve.

1,411,419. ARRANGEMENT FOR STARTING AND REGULATING DIRECT-CURRENT ELECTRIC MOTORS; Fernand Cumont, Paris, France. App. filed April 1, 1913. For starting speed regulation and regenerative running.

1,411,430. INCANDESCENT LAMP TESTER; John Graves, Madison, Wis. App. filed Jan. 16, 1920. Especially for testing miniature lamps.

1,411,442. DYNAMO-ELECTRIC MACHINE; Bennett M. Leece, Cleveland, Ohio. App. filed March 14, 1921. Frame construction of automobile starting motors and generators.

1,411,465. OPERATOR'S CIRCUITS; Harold T. White, Kansas City, Kan. App. filed Sept. 6, 1917. Balanced telephone circuit provided with test circuit.

1,411,478. ELECTROMECHANICAL SWITCHING SYSTEM; Isaac D. Budd and Claude I. Cronburg, Chicago, Ill. App. filed May 25, 1914. Automatic and semi-automatic telephone switching.

1,411,497. ELECTRIC CALL SYSTEM FOR HOTELS; Irwin A. Hill, Fairbury, Neb. App. filed Aug. 9, 1920. Automatic signal to call guest at predetermined time.

1,411,499. DIRECTION SIGNAL FOR AUTOMOBILES; William W. Lincoln, Washington, D. C. App. filed Oct. 7, 1920. Operated by relays.

1,411,507. APPARATUS FOR EFFECTING CHEMICAL REACTIONS BY MEANS OF AMALGAMS; Herman W. Paulus, Richmond Hill, N. Y. App. filed Feb. 26, 1921.

1,411,530. ELECTROLYTIC CAUSTIC SODA CELL; Noel Statham, Hastings-on-Hudson, N. Y. App. filed May 31, 1917. For producing caustic alkali.

1,411,537. METHOD OF MAKING GRAPHITIZED MATERIAL; Alan P. Sullivan, St. Marys, Pa. App. filed Jan. 26, 1921. For electrodes, brushes, etc.

1,411,584. LAWN MOWER; John W. Peters, Roslyn, N. Y. App. filed Aug. 10, 1921. Electrically propelled.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

CHESTER, MASS.—The Chester Electric Company contemplates the installation of a 40-hp. to 50-hp. oil-engine-driven generating unit (125-250 volts, direct current). E. Roy Gardiner is manager.

EVERETT, MASS.—The Everett Factories Corporation will build a one-story power plant on Vine Street, in connection with a new four-story industrial plant at this location.

PLYMOUTH, MASS.—The Plymouth Electric Company contemplates the erection of 12 miles of three-phase, 22,000-volt transmission line this year. C. F. Gardner is manager.

READING, MASS.—The Municipal Light Department is planning to install thirty-five additional street lamps. Arthur G. Sias is manager.

WESTERLY, R. I.—The Westerly Light & Power Company will install a new switchboard. W. C. Clarke is general manager.

Middle Atlantic States

ALBANY, N. Y.—The Municipal Gas Company has awarded a contract to the William G. Sheehan Construction Company for the erection of an addition to its Riverside electric plant, 52 ft. x 70 ft.

ALBANY, N. Y.—Plans are under consideration by the State Engineering Department, Albany, for the construction of hydro-electric plants at the Crescent Dam and Visscher's Ferry to develop about 10,000 hp. The power will be used to operate locks, bridges, etc., on the barge canal.

CANAJOHARIE, N. Y.—The Montgomery Electric Light & Power Company contemplates the erection of 2 miles of 2,200-volt rural lines and a new secondary substation. A. B. Ciarns is superintendent of distribution.

COHOES, N. Y.—The Cohoes Power & Light Corporation will make extensions and improvements to its hydro-electric plants and system, to cost about $750,000.

COPENHAGEN, N. Y.—The Deer River Power Company contemplates the installation of a 1,000-kw. General Electric generator directly connected to a S. Morgan Smith waterwheel. V. C. Wood is manager.

DANSVILLE, N. Y.—The Cottonwood Point Cottage Association, recently organized, plans the installation of an electric light and power system at Cottonwood Point. Peter LeForce is in charge.

LISLE, N. Y.—The Lisle Electric Company has applied to the Public Service Commission for permission to construct an electric lighting plant to supply electricity in Lisle.

NEW YORK, N. Y.—The New York Edison Company has awarded a contract to the Keen-Well Contracting Company, 841 Broadway, for the erection of a substation at 33 Attorney Street, to cost $75,000. Plans have also been completed for extensions to the substation at 115 East Twelfth Street, to cost about $120,000.

ROCKVILLE CENTRE, N. Y.—The Knickerbocker Ice Company will build a two-story addition to the power house, 34 ft. x 54 ft., at its local plant.

UTICA, N. Y.—The New York State Railways, Inc., has issued $3,000,000 in bonds, part of the proceeds to be used for extensions and improvements in electric plants and system. J. F. Hamilton is president.

HAWTHORNE, N. J.—The Cupra Silk Company will build a one-story power house in connection with a mill at Clifton, N. J. The Technical Advisory Corporation, 132 Nassau Street, New York, is engineer.

JERSEY CITY, N. J.—The Fulton Terminal Lumber Company, 21 East Fortieth Street, New York, will install a complete electrically equipped yard at its new terminal on the Hackensack River, near Jersey City, including cranes, conveying, hoisting and other machinery. Ernest R. Shaw is manager.

LAKEWOOD, N. J.—The Lakewood & Coast Electric Company is considering the installation of two 500-hp. boilers. A. S. Phelps is general superintendent.

BROCKPORT, PA.—The Brockport Electric Company, recently organized, has made application to the Public Service Commission to install and operate a local system.

HARRISBURG, PA.—The Harrisburg Light & Power Company will build a one-story substation on Maclay Street. The station has been ordered by the Public Service Commission.

KINGSTON, PA.—The Luzerne County Gas & Electric Company contemplates extensions to its power plant, including the installation of a 20,000-kw. turbo-generator and auxiliary equipment, to cost about $350,000.

PHILADELPHIA, PA.—The Pennsylvania Apartments, Inc., will build a two-story power plant, 25 ft. x 108 ft., in connection with a new apartment hotel at 3905 Sansom Street, to cost about $1,000,000.

SCRANTON, PA.—The Scranton Electric Company contemplates replacing the overhead system with underground wires in different parts of the city during the present year, to cost about $60,000.

TURTLE CREEK, PA.—The Council has passed an ordinance authorizing the installation of an ornamental street-lighting system on Braddock, Penn and Air Brake Avenues, from the East Pittsburgh to the Wilmerding city lines.

TYRONE, PA.—Plans are being considered for the construction of a hydro-electric plant on the Juniata River to supply electricity in this section of the State. Frank Waring, Tyrone, is said to be interested in the project.

WRIGHTSVILLE, PA.—The Wrightsville Light & Power Company is preparing to extend its transmission lines to East Prospect, a distance of 4 miles, to furnish electrical service in that borough.

BALTIMORE, MD.—A one-story power house will be erected by the General Chemical Company, Race and Winder Streets, at its local plant.

BALTIMORE, MD.—The Mexican Petroleum Corporation, 120 Broadway, New York, will build an electrically operated pumping plant in connection with a number of new buildings on First Avenue, Baltimore.

LURAY, VA.—The Shenandoah River Light & Power Corporation is considering the installation of a new generating unit. E. M. Berrey is manager.

NORFOLK, VA.—Bids will be received at the office of the United States Engineer Office until May 12 for the construction of a switchboard room at Fort Story, Cape Henry, Va.

PETERSBURG, VA.—The Community Power Company will construct a dam and hydro-electric power plant on the Potomac River, near Romney, W. Va. Permission has been granted by the Public Service Commission.

PURCELLVILLE, VA.—The Loudon Light & Power Company will extend its lines to the towns of Hillsboro and Lincoln. R. B. Brown is secretary and manager.

SOUTH HILL, VA.—Bids will be received by N. G. Smith, town clerk, until May 1 for the construction of a municipal electric plant. The J. B. McCrary Engineering Corporation, Atlanta, Ga., is engineer.

North Central States

CASEVILLE, MICH.—The Council contemplates the construction of a transmission line to Kinde to connect with the lines of the Central Power Company. A local distributing system will be installed.

DETROIT, MICH.—The Detroit Edison Company contemplates the construction of a new substation on Scotten Avenue.

HARTFORD, MICH.—Anderson Brothers, owners of the local electric light plant, expect to install a 200-hp. oil engine, generator and switchboard. M. J. Anderson is manager.

KINDE, MICH.—The Central Power Company, Bad Axe, plans to extend its transmission line from Kinde to the Lake Huron summer resort district, to supply electrical service.

PONTIAC, MICH.—Plans are under way for extensions to the street-lighting system in the business district. City Manager Brower is in charge.

WINTERFIELD, MICH.—The Winterfield Light & Power Company is planning to build a hydro-electric plant in Winterfield County and to erect a transmission system to include Tustin, Leroy, Avondale, Ewart and other towns in this section. W. L. Kinney is general manager.

BELLEFONTAINE, OHIO.—Bonds to the amount of $133,680 have been authorized for municipal improvements, of which about $90,000 will be used for extensions to the municipal electric plant.

CARDINGTON, OHIO.—The Cardington Electric Light, Heat & Power Company expects to make connection with a high-tension transmission system this summer. George M. Schambs is secretary.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, room 219, City Hall, until April 27 for furnishing and setting lead wall-insulating lining for the city hospital building, Scranton Road, Cleveland. Bids will also be received until April 28 for fiber conduit.

GALION, OHIO.—A combined electric and waterworks plant is being erected on a reservoir east of the town. The present boilers and the Allis-Chalmers 200-kva. engine unit will be used. The new equipment will include a 750-kva. turbo-alternator, stokers, coal and ash-handling equipment, motor and turbine driven auxiliaries, condensers, heater, etc. H. L. Herrick is superintendent.

GANGES, OHIO.—The Rural Electric Service Company, Shelby, will erect a new transmission line and distributing system at Ganges.

WEST UNION, OHIO.—Charles W. Riffle, owner of the local electric light plant, contemplates the installation of a new 90-hp. oil-engine-driven generating unit.

CARROLLTON, KY.—Improvements are contemplated to the municipal electric light plant and water works, which may include the installation of new boilers and a third generating unit. Preparations are under way for installing electric motor-driven machinery, for which bids have been received. J. W. Nash is manager.

CLAY, KY.—The Kentucky Utilities Company will build a 33,000-volt transmission line from Clay to Morganfield, to cost about $75,000.

GHENT, KY.—The Ghent Electric Light Company contemplates installing a 15-hp. Fairbanks-Morse gas engine, type Y, with a small generator, for auxiliary use, to replace its storage batteries for day service. The company would like to obtain a good second-hand machine if possible. L. G. Matthews is secretary.

LIBERTY, KY.—The Liberty Roller Mill Company will install a 25-hp. Fairbanks-Morse oil engine and a 35-kw. direct-current generator. John D. Allen is manager.

LOUISVILLE, KY.—The Louisville Gas & Electric Company contemplates the erection of a hydro-electric plant in the vicinity of Dam No. 41, Ohio River, with initial capacity of 25,000 hp. and ultimate capacity of 75,000 hp. Application for permission has been made to the Federal Power Commission.

WILLIAMSBURG, KY.—The Williamsburg Electric Company expects to extend its transmission lines to the village of Savoy, a distance of 1 mile. C. Perkins is manager.

HOPE, IND.—Pulse & Hope, owners of the local electric light plant, contemplate the erection of a 16-mile transmission line to Edinburg to connect with the system of the Interstate Public Service Company, from which it will purchase electricity. Kenneth Hodges is manager.

JASPER, IND.—The Municipal Electric Light Department is considering extending the electric line about 1 mile into the suburbs. A. P. Dudine is city clerk.

PERU, IND.—The Council contemplates the purchase of a 2,000-kw. turbo-generator and a 525-hp. water-tube boiler for the municipal electric light and water plant. William O'Hara is general superintendent.

ATLANTA, ILL.—Contract has been closed whereby the Atlanta Electric Light & Power Company will erect a high-tension transmission line to the power station of the Lincoln Water & Light Company, where it will secure electricity to operate its system.

HIGHLAND, ILL.—The installation of a 750-kw. generating unit, driven by a "Uniflow" engine, in the municipal electric light plant and rebuilding the distributing system are under consideration. Charles E. Easley is electrical engineer.

JOLIET, ILL.—The Public Service Company of Northern Illinois has issued $5,000,000 in bonds, part of the proceeds to be used for a new generating plant at Waukegan, Ill., to have an ultimate capacity of 200,000 kw.

LINCOLN, ILL.—The Lincoln Water & Light Company has closed a contract with the Atlanta (Ill.) Electric Light & Power

Company, which serves Atlanta and McLean, whereby it will furnish the latter electricity to operate its system. E. MacDonald is manager.

MOUNT CARMEL, ILL. — The Mount Carmel Public Utility & Service Company contemplates the purchase of new generating equipment of 600 kw. capacity, and also rebuilding about 3 miles of pole line. P. Barnhard is manager.

NAPERVILLE, ILL. — Contracts have been placed for one 360-hp. Diesel oil engine and a 312-kva. generator for the municipal electric light plant. A 125-hp. engine and a 75-kw. generator will be discarded when the new equipment is installed. Oliver W. Strubler is manager.

BIRCHWOOD, WIS. — The Wisconsin-Minnesota Light & Power Company, Eau Claire, will build a transmission line from Rice Lake to Birchwood, about 21 miles. Distribution systems will be installed at Mikana, Campia, Angus and other points along the route.

WAUWATOSA, WIS. — The Milwaukee County Board of Administration, Milwaukee, has plans under way for the erection of a new electric power plant at Wauwatosa for county service, to cost about $500,000. Vaughn & Meyer, Security Building, Milwaukee, are engineers.

KENYON, MINN.—The Gunderson Electric Company, Inc., may erect a few miles of farm lines. R. T. Gunderson is manager.

CEDAR RAPIDS, IOWA.—John A. Reed and associates are organizing a new company to construct and operate a hydro-electric power plant on the Maquoketa River, at Maquoketa. Holland, Ackerman & Holland, Ann Arbor, Mich., are engineers.

MONTGOMERY CITY, MO.—The Montgomery Power Company expects to erect a transmission line to New Florence. E. H. Algermissen is president and manager.

FESSENDEN, N. D. — The Fessenden Light & Power Company contemplates the installation of a 100-hp. Fairbanks-Morse type Y engine and a 125-kva. generator of the same make, and switchboard panel. H. C. Whitcomb is manager.

ARNOLD, NEB.—The Brittan Electric Company expects to install an additional water turbine. W. Brittan is manager.

COTTONWOOD FALLS, KAN. — The Home Light & Power Company is contemplating the erection of 22 miles of transmission line and purchasing electricity from the Kansas Electric Utilities Company, Emporia. W. W. Austin is owner and manager.

LEAVENWORTH, KAN.—The Leavenworth Light, Heat & Power Company contemplates the installation of a 1850-kva. Westinghouse turbine and auxiliary apparatus. W. H. Frost is general manager.

PLAINS, KAN.—The installation of a 50-hp. Fairbanks-Morse type Y engine, with a 30-kw. 110-120-volt direct-current generator, in the municipal electric plant is under consideration by the Municipal Water and Light Department. J. H. Jerrell is superintendent.

Southern States

BAILEY, N. C.—E. H. Liles, Middlesex, and associates have been granted a franchise to install and operate an electric lighting system in Bailey. Similar systems will be installed at Middlesex and Wilson, to cost about $60,000.

CHAPEL HILL, N. C.—Extensions are contemplated to the electric plant of the University of North Carolina, including the installation of 300-kva. generator and engine, Babcock & Wilcox boilers (350 hp.), and also improvements to the transmission lines and distribution system. J. S. Bennett is general superintendent.

WASHINGTON, N. C.—The installation of a 500-hp. boiler in the municipal electric light plant is under consideration. George P. Womble is superintendent.

ATLANTA, GA.—The Fulton Bag & Cotton Mills plan the erection of an addition to their power plant, to cost about $75,000. J. E. Sirrine & Company, Greenville, S. C., are engineers.

BROXTON, GA.—The installation of a 60-hp. boiler in the municipal electric light plant is under consideration. C. A. Poer is clerk.

MILLEN, GA.—Plans are being prepared for an addition to the municipal power plant, to cost about $25,000. Lawrence Manning is city engineer.

MOULTRIE, GA.—During the coming year the municipal electric generating plant will be discontinued and electricity will be obtained from the hydro-electric plant of the Baker County Power Company, Newnan, 50 miles west of Moultrie. J. M. George is superintendent of municipal plant.

THOMASVILLE, GA. — The Municipal Water and Light Department is considering the construction of a new building, to cost about $25,000, within a few months. D. R. Pringle is superintendent.

WAYCROSS, GA. — The Ware County Light & Power Company contemplates the installation of additional ornamental lamp standards, extensions to street-lighting system, etc. R. E. Trexler is assistant treasurer.

BUNNELL, FLA.—The Light and Water Department contemplates the installation of complete electric generating unit in the municipal electric plant. Charles Harris is superintendent.

CHATTANOOGA, TENN.—The Chattanooga & Tennessee River Power Company and the Tennessee Railway, Light & Power Company are being consolidated in a new company to be known as the Tennessee Electric Power Company. Tentative plans are under way for extensions.

JOHNSON CITY, TENN.—The Holston River Power Company, recently organized, has plans under way for the construction of a power plant on the Holston River. At a later date a similar hydro-electric plant will be erected on the Watauga River, with total capacity of stations of about 100,000 hp. James B. Cox heads the company.

MEMPHIS, TENN.—An electrically operated pumping plant will be installed in connection with improvements and extensions to the waterworks, to cost about $300,000. Equipment bids will be taken in June. Fuller & McClintock, 421 Produce Exchange Building, Kansas City, Mo., are engineers.

EUFAULA, ALA.—The Council will soon call for bids for the construction of an electrically operated pumping plant in connection with improvements to the waterworks. The Ludlow Engineering Company, Winston-Salem, N. C., is engineer.

BATESVILLE, ARK.—The commissioners of the municipal electric light and water plant will rebuild pole line and install a filter at the water plant this summer. W. H. Walkup is manager.

BENTON, ARK.—The Board of Water and Light Commissioners is considering the installation of a 150-kva. or 200-kva. "Uniflow" engine, generator and switchboard in the municipal electric plant. G. A. Smith is superintendent.

DE QUEEN, ARK.—The De Queen Light & Power Company will build a transmission line from Horatio to Lockesburg, 40 miles long, and will install substations and local distributing systems at these places as well as other points along the route.

PINE BLUFF, ARK.—The Pine Bluff Company is considering a possible extension of 12 miles to its transmission lines. J. L. Longino is manager.

NEW ORLEANS, LA. — Fire Commissioner Fitzpatrick is considering making a recommendation to the Commission Council for the purchase of a portable light plant.

WINNSBORO, LA.—The White Light & Power Company will install a 150-hp. generating unit and is also considering furnishing power for operating the waterworks pumping station. E. O. White is secretary and manager.

MUSKOGEE, OKLA. — The Oklahoma General Power Company has purchased a site near Muskogee and is preparing plans for the erection of a new steam-operated electric generating plant, with extensive transmission system, to cost about $2,750,000. The initial installation will have an output of 10,000 hp. It is operated by the Byllesby Engineering & Management Corporation, Chicago, Ill.

SHIDLER, OKLA.—The Shidler Light & Power Company, recently organized, contemplates the construction of a transmission line from Shidler to Pawhuska, to supply electricity in Shidler. J. C. Blankenship heads the company.

TALIHINA, OKLA.—The City Water and Light Department will build a new waterworks system and will probably install hydro-electric equipment. Edgar M. Cooper is general superintendent.

TULSA, OKLA.—The Oklahoma Power Company will build an addition of 10,000 kw. capacity to its hydro-electric plant on the Arkansas River.

CAMERON, TEX.—The Cameron Water, Power & Light Company contemplates extensions to its generating plant, to cost about $60,000.

GREENVILLE, TEX.—Plans are under consideration for extensions to the municipal electric light plant within the next eighteen months, including the installation of a 1,000-hp. boiler and a 1,000-kw. turbine. H. L. McLow is manager.

CONROE, TEX.—The Conroe Gin & Light Company contemplates the installation of a 95-hp. Diesel engine. Henry Thompson is secretary and manager.

DECATUR, TEX.—The Decatur Light & Water Company expects to erect a 3-mile transmission line to the pumping plant at Lake. C. P. Dodson is proprietor and manager.

HEMPSTEAD, TEX. — The Hempstead Light & Power Company contemplates installing an additional 75-hp. oil engine during the coming winter. W. A. Darter is president.

PAMPA, TEX.—The Pampa Water, Light & Power Company contemplates installing another 75-hp. oil engine and making further line extensions. W. P. Davis is manager.

PORT ARTHUR, TEX.—Bids will soon be asked for electric pumping machinery for the municipal waterworks. N. C. Erwin is city engineer.

Pacific and Mountain States

SEATTLE, WASH.—Bids will be received by the Board of Public Works, County-City Building, until May 5 for steel penstocks for the Gorge plant at the Skagit River power development.

YAKIMA, WASH.—The Pacific Power & Light Company will make improvements in its local system to cost about $18,000.

McMINNVILLE, ORE.—Plans are being prepared for the construction of a municipal hydro-electric power plant on the Nestucca River, to cost about $300,000.

MORO, ORE. — The Sherman Electric Company expects to rebuild the Wasco and Moro distributing system to standard construction and install series street-lighting systems. Roy F. Dean is manager.

MYRTLE CREEK, ORE. — Extensions and improvements are to be made to the municipal light and water plant for which $30,000 in bonds have been issued. The work will include the installation of a 75-kw. alternating-current generator and a new water supply. S. S. Morris is engineer power station.

FRESNO, CAL.—The San Joaquin Light & Power Corporation has issued $3,500,000 in bonds, the proceeds to be used in connection with the erection of new hydro-electric generating plants and transmission-line extensions.

QUINCY, CAL. — The Quincy Electric Light & Power Company will start work about May 1 on the erection of a three-wire, three-phase transmission line from Quincy to Indian Falls, to connect with the system of the Great Western Power Company. William Charles Walls is superintendent.

SALINA, CAL.—The Coast Valleys Gas & Electric Company contemplates an extension of its 11,000-volt transmission line from King City to San Ardo, a distance of 20 miles, to reach an unserved portion of Monterey County. James F. Pollard is vice-president.

SAN DIEGO, CAL.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until April 26 for the installation of a street-lighting system at the naval hospital, San Diego. (Specification 4614.)

BONNERS FERRY, IDA.—The Council is considering the construction of a municipal power plant at Moyea, near the city, to cost about $25,000.

CAMBRIDGE, IDA.—The Adams County Light & Power Company contemplates the construction of a dam to increase its water-storage capacity and also some new extensions. N. Gustard is secretary and treasurer.

NOGALES, ARIZ.—The Nogales Electric Light & Power Company expects to purchase an oil engine of about 300 hp. capacity. C. C. Nordholm is superintendent.

EUREKA, MONT.—The Eureka Hydro Electric Company contemplates the construction of a new hydro-electric plant on Graves Creek.

DENVER, COL.—Extensive additions are contemplated to the ornamental street-lighting system for the Broadway extension and several of the streets in the lower part of the city. The cost is estimated at about $100,000.

RYE, COL.—An electric power plant will soon be installed in the town of Rye. The proposed plant will be driven by water power.

YUMA, COL.—Extensions are contemplated to the municipal electric light plant and waterworks system, including the installation of forty ornamental street lamps, one 500-gal. and one 750-gal.-per-minute fire pump. After July 1 the municipal plant will supply electricity to the town of Eckley. Dan J. McQuaid is city manager.